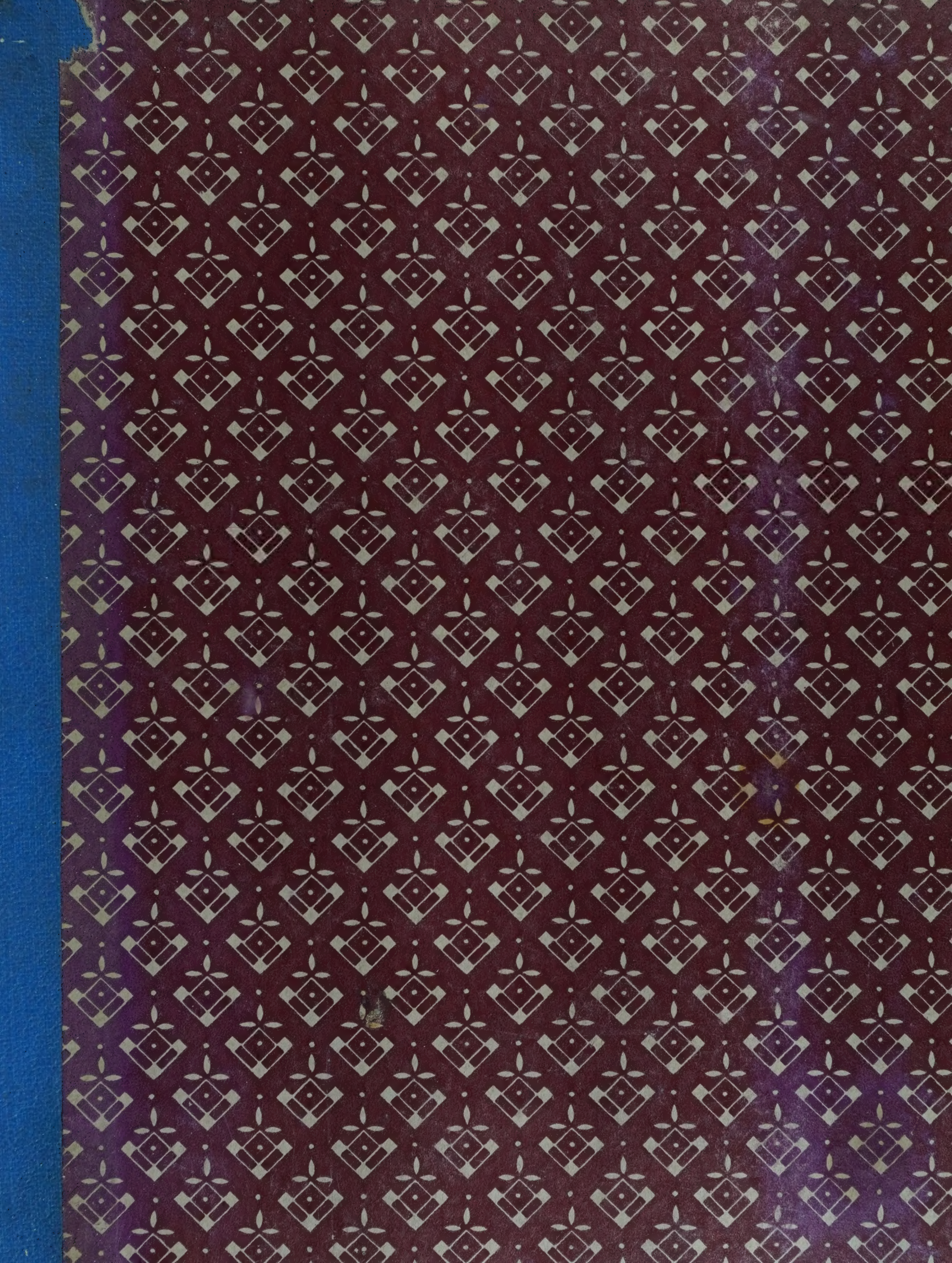

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# CONTENT AND ANALYSIS OF LEAD IN FOODS

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See also back page

1 H 13

**Determination of heavy metals in wines by atomic absorption spectrophotometry.**

Meranger, J. C.; Somers, E.

Journal of the Association of Official Analytical Chemists 51 (4) 922-25 (1968) [10 ref. En] [Res. Lab., Food & Drug Directorate, Dept. of Nat. Health and Welfare, Ottawa, Ontario, Canada]

The effect of alcohol and sugar concn. on the atomic absorption analysis of Cu, Zn, Ni, Cr, Pb, Cd, and Co has been investigated. Sugar reduced the sensitivity of analysis but could be compensated for by using the method of additions. Interference from alcohol was avoided by introducing an evaporation stage, and the concn. of the above cations was determined by direct aspiration in 24 native and imported wines. AS

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1 T 6

**Collaborative study of the determination of lead number of vanilla extract by chelometric titration.**

Johnson, A. R.

Journal of the Association of Official Analytical Chemists 51 (4) 822-25 (1968) [10 ref. En] [Division of Food Chemistry & Technology, Food & Drug Administration, Washington, D.C. 20204, USA]

The Wichmann lead number has been used for >45 yr as an index of vanilla constituents in extracts. A rapid method for lead number determination by chelometric titration was reported by Considine [Fd Technol., Champaign (1959) 13:730]. This method was subjected to intralaboratory and collaborative study. The method is rapid and accurate, and is recommended for adoption as official, 1st action. AS

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2 C 55

**[Investigation of the toxicity of lead with regard to Aspergillus niger.]**

Zlochevskaya, I. V.; Rabotnova, I. L.

Mikrobiologiya 37 (4) 691-96 (1968) [6 ref. Ru, en] [Moskovskii gosudarstvennyi univ. im. M.V. Lomono-sova, Biologo-pochvennyi fakultet, Kafedra mikrobiologii, USSR]

The problem of protection of various materials against mould infection is discussed. The objects of the investigation were chelates, formed by heavy metals with organic compounds. Pb formed complex compounds with cysteine, asparagine and citric acid, and these affected the precipitation of phosphates from the medium by Pb. The most toxic effect with regard to Aspergillus niger was displayed by Pb ions and by complex compounds of Pb with di-cysteine. Asparagine and citric acid formed less toxic complexes. The accumulation of citric acid by the mould resulted in the detoxication of the Pb ions. The Pb does not act as a fungicide, but it acts fungistatically. STI

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2 F 70

**[Uptake of lead and tin by canned fats and fatty foods.]** Zur Blei- und Zinnaufnahme von Fetten und fettreichen Lebensmitteln in Weissblechdosen.

Bergner, K. G.; Rüdt, U.

Zeitschrift für Lebensmitteluntersuchung und Forschung 137 (6) 338-52 (1968) [32 ref. De] [Inst. für Lebensmittelchemie der Univ., Stuttgart, W. Germany]

Commercially canned oils and fats contained <1 mg/kg of Pb and Sn, i.e. below health hazard level. Considerable variation existed between individual samples. After 12 months of storage, refined soya bean oil in smooth seamed cans contained 20 µg Pb/kg and 10 µg Sn/kg, but oil in buckled cans contained >100 µg Pb/kg; pork and beef in lacquered seamed cans contained 10-20 µg Pb/kg, and 25-35 µg Sn/kg, with corresponding levels of 60-70 µg Pb/kg and 40-50 µg Sn/kg for fatty meat and liver sausage in lacquered tins with overlapping soldering; liver pastes in flat oval cans with roll away lids had 200-800 µg Pb/kg and 20-60 µg Sn/kg, due to greater surface of contact. Uptake of Pb was in the form of the salts of fatty acids, and was enhanced by high acid and peroxide content. Pb and 98% Pb/2% Sn solder was more strongly corroded than Sn and 65% Pb/35% Sn solder. Diffusion of the metal salts through the contents of the cans was in accordance with Fick's law. Procedures for determining Pb and Sn in food samples and sensitivity of methods are given. RM

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2 L 67

**[Traces of lead compounds in white sugar.]**

Gawrych, M.;

Gazeta Cukrownicza 76 (8) 184-87 (1968) [5 ref. Pl, ru, en, de] [Inst. Przemyslu Cukrowniczego, Warszawa, Poland]

Analyses of 4 samples of refined powder, 16 samples of white sugar and 3 samples of industrial sugar were carried out. In mineralizing the sugar by conc. $H_2SO_4$: $HNO_3$, the same results were obtained as in mineralizing by perhydrol. The method, using acids, however, is more convenient for determining Pb. Traces of resolved Pb were determined by the dithizone colorimetric method. ICUMSA recommends the dithizone method using chloroform extraction without sugar mineralization for refined sugar. Both methods used for refined sugar and white sugar yielded identical results. The analysed samples of sugars from various Polish sugar plants yielded a smaller amount of Pb than allowed by the standards of various states for the FAO codex. Polish sugars contain from 0-0.6 mg/kg Pb, although the suggested standards have an upper limit of 2 mg/kg. STI

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3 C 84

**[Contamination of vegetables by emissions from lead-works.]** Verunreinigungen von Gemüse aus Emissionen einer Bleihütte.

Kerin, Z.

Qualitas Plantarum et Materiae Vegetabiles 15 (4) 372-79 (1968) [3 ref. De, en, fr] [Inst. für Arbeitsmedizin und Radiologie, Belgrade, Deligradska 29, Yugoslavia]

Soil and snow analysis showed increased Pb content $\leqslant$ 10 km radius from lead-works. Increased Pb in vegetables was found over a wider radius than $SO_2$ damage. Values for Pb (ppm, dry matter) are given for endives, chicory, cabbage hearts, sauerkraut, beans, parsley leaves, parsley roots, potatoes, beetroot and carrots. Washed and unwashed leaf vegetables, peeled and unpeeled root vegetables were compared with similar samples from uncontaminated areas. Increased Pb (10-50 times) could be only partially removed by washing or peeling. The long term effects, especially of soil contamination, are discussed. RM

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4 H 337

**[Fruit juices. IV. Alterations and contamination.]**

Martinez, A. G.

**Ion (Madrid) 28 (327) 701-08 & 711 (1968) [Es]** [Escuelas de Ingenieria Tecnica Industrial y Pericial de comercia de Jaen, Spain]

A review which includes a comparison of 7 commercial pectic enzyme preparations for clarification of fruit juices; clarification procedure; constructional materials for equipment and contamination by Cu, As, Pb, Zn; influence of composition and processing on microbiological flora; materials and methods for cleaning and sterilizing equipment. ELC

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5 H 515

**[Lead in canned aerated beverage.]**

Biino, L.; Carlisi, E.

**Rassegna Chimica 20 (6) 263-65 (1968)** [17 ref. It, fr, en, de] [Istituto Merceologia, Univ. degli Studi, Via Balbi 5, Genoa, Italy]

Pb present in carbonated beverages (Coca-Cola) in bottles and in cans was determined spectrophotometrically to establish whether the soldered joints on the tinned steel led to Pb contamination of the contents. Sn was previously removed to eliminate interference. Mean Pb contents of the canned and bottled products were 0.0072 and 0.0067 ppm, respectively. It is concluded that no Pb is taken up by the beverage from the container. HSi

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5 L 199

**[Comparative polarographic and photometric determination of lead and copper ions in white sugar.]**

Mauch, W.; Gierschner, K.; Feier, U.

**Industrielle Obst- und Gemüseverwertung 54 (1) 1-6 (1969)** [18 ref. De] [Inst. für Zuckerindustrie, Technische Univ., Berlin, Germany]

Contents of Pb and Cu ions were determined (i) polarographically by the method of Jones [Analytica chim. Acta (1952) 7: 578] and (ii) photometrically [method of Internationale Fruchtsaftunion (1964) Analysenvorschläge Nr. 14, 1-5 for Pb and the ICUMSA method, quoted in Whlaley, H. C. S. de, ICUMSA - Methods of sugar analysis (1964) p. 106 (Amsterdam)] in 9 samples of refined and 6 samples of standard white sugar from W. Germany and UK. Pb content was very low (0-0.2 mg/kg) and results by the 2 methods did not differ appreciably. Mean values for Cu content were: (i), 0.49 and (ii), 0.47 mg/kg; the differences were not significant. SKK

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5 N 178

**Metal catalysed lipid oxidation. [A symposium]**

Marcuse, R. (Editor)

**pp.171-292 (1968)** [Numerous ref. En] **Kallebäck, Göteborg, Sweden: Svenska Inst. für Konserveringsforskning**

Papers read in the 4th section of the symposium were: "Oxidation through metal catalysis and flavour stability of foods containing animal fats", by A. Patron (pp. 171-96); "Heavy metal catalysed development of rancidity in fish muscle", by W. Schmidtsdorff (pp. 197-202); "Cu in milk", by E.-G. Samuelsson (pp. 203-14); "Deteriorative occurrence and effect of metals in vegetable oils", by R. Ohlson (pp. 215-20); "The effect of ferric stearate addition to groundnut oil", by J. H. Pierce (pp. 221-29); "Demetalization of edible vegetable oils", by A. Vioque (pp. 231-50); "Evaluation of several demetalization procedures leading to decrease the prooxidative activities of Cu in soybean oil", by A. Letan and S. Kronzon (pp. 251-57); "The effect of metal contamination from plant equipment on flavour stability of margarine", by U. Holm (pp. 259-64); "Metal traces in packaging materials and their influence on lipid oxidation", by O. Billing (pp. 265-67); and "Studies on the influence of traces of heavy metals in packaging materials on the oxidative changes in butter", by C. Knezevic and R. Radtke (pp. 269-72). Discussions on the papers are included. JA

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6 B 268

**[Investigation of the toxic properties of some lead compounds.]**

Zlochevskaya, I. V.; Rukhadze, E. G.

**Mikrobiologiya 37 (6) 1116-21 (1968)** [10 ref. Ru, en] [Moskovskii Gosudarstvennyi Univ. im. M. V. Lomonosova, Biologopochvennyi Fakul'tet, Kefedra Mikrobiologii, USSR]

The toxic effects of some Pb compounds on the growth of Aspergillus niger, which frequently causes damage to various industrial materials and agricultural products, was investigated. It was found that the toxic effect of certain salts and chelates of Pb on A. niger depended on the form in which the Pb was applied to the culture. Inorganic compounds (PbO, $PbCO_3$, $Pb(OH)_2$, and PbS) as a result of their insolubility in water, are not toxic. The toxic effect of organic salts of Pb (lead acetate and oleate) is approx. the same as that of the $Pb^{2+}$ ion. Certain complex compounds of Pb displayed fungicidal effect on A. niger. STI

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6 C 253

**[Penetration of Pb into canned products stored in cans with seams joined by solder containing 63% Pb.]**

Legatowa, B.; Gorgon, A.; Zyszczynska, B.; Juraniec, I.

Roczniki Panstwowego Zakladu Higieny 19 (6) 709-11 (1968) [1 ref. Pl, ru, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku, PZH, Warsaw, Poland]

Pb content of various canned products, packaged in cans with seams soldered with a mixture of 37% Sn and 63% Pb, was determined after 3, 6 and 12 months' storage. No Pb was detected at 3 months in any of the products, and none was detected throughout in 3-5 samples of tomato juice, pickled cucumbers, 'Gdansk' herrings in oil or in their own juice. 2 samples of tomato concentrate contained 0.2 and 0.4, 1.0 and 1.2 mg/kg after 6 and 12 months, respectively (max. permitted, 2 mg/kg). In a 3rd sample, 0.2 mg/kg was detected at 6 months only. 3 samples of stewed plums contained 0.8-10 mg/kg after 12 months, and 1 of them contained 0.4 mg/kg after 6 months (max. permitted, 0.4 mg/kg). All 4 samples of herring in tomato sauce contained 0.2 mg/kg after 12 months. SKK

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6 R 169

**Determination of the heavy metal content of sea-foods by atomic absorption spectrophotometry.**

Meranger, J. C.; Somers, E.

Bulletin of Environmental Contamination ad Toxicology 3 (6) 360-65 (1968) [9 ref. En] [Res. Lab., Food and Drug Directorate, Dept. of Nat. Health and Welfare, Ottawa, Canada]

25 g samples of sea-food slurry (salmon, clam chowder, tuna, oyster, sardine and crab meat) were oxidized by dry-ashing. The ash was dissolved in 2 ml conc. $HNO_3$, diluted with 25 ml $H_2O$ and heated to boiling. The solutions were filtered and made up to 100 ml. Solutions of the samples were atomized in an atomic-absorption spectrophotometer. The acidity of a multi-element standard solution of 8 metals was adjusted to 5% (v/v) with $HNO_3$. The dry ash technique was checked and satisfactory recovery of metals was obtained. The metal content of the sea-foods was determined by 2 methods: the method of addition, and direct comparison of unknown with a standard metal solution. The latter, simpler, technique is suitable for all metals except Ni. High levels of Cu and Zn previously reported were found and the levels of Mn and Pb in clam and oyster and Cd in oyster were significant. SW

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7 C 350

**[Metal contaminants in milk and milk products.]**

Metalle als Fremdstoffe in Milch und Milchprodukten.

Kästli, P.

Schweizer Archiv für Tierheilkunde 111 (3) 149-53 (1969) [14 ref. De, fr, it, en] [Humboldtstrasse 55, Bern, Switzerland]

Increases in amounts of Al, As, Cu, Fe, Hg, I, Mo. Pb and Zn contained in milk, through secretional and post-secretional contamination, are described. These metals are discussed with regard to their effect from the point of view of hygiene and detraction from quality of milk and milk products. [See also Int. Dairy Fed. a. Bull. (1968) part 5.] AS

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7 J 587

**[Macro- and trace elements in cedar nut kernels.]**

Rush, V. A.; Lizunova, V. V.

Voprosy Pitaniya 28 (2) 52-55 (1969) [12 ref. Ru, en] [Novosibirskii Inst.Sovetskoi Kooperativ noi Torgovli, USSR]

Samples of kernels were obtained within 1 month of harvest from commercial batches of the 1966 crop of cedar nuts from 13 districts in the Irkutsk, Krasnoyarsk and Novosibirsk regions. Mean values with SEM for mineral contents of kernel DM are tabulated for each district. Ash content ranged from 2.49 to 2.69%. Ranges of mean values with SEM were (mg/100 g): P, 486 ± 17 to 716 ± 29; Mg, 259 ± 14 to 489 ± 21; K, 351 ± 15 to 404 ± 18; Na, 39 [?] ± 5 to 114 ± 9; Ca, 35 ± 2 to 50 ± 4μ Fe, 2.0 ± 0.17 to 3.8 ± 0.14. For trace elements the values were (mg/kg): Mn, 5.2 ± 0.25 to 9.8 ± 0.58; Cu, 1.5 ± 0.13 to 3.3 ± 0.14; Zn, 8.9 ± 0.41 to 14.0 ± 0.55; Mo, 0.10 ± 0.001 to 0.20 ± 0.008; Si, 2.1 ± 0.19 to 3.7 ± 0.21; Al, 3.0 ± 0.11 to 7.0 ± 0.26; I, 0.38 ± 0.002 to 0.93 ± 0.042; B, 0.0001 ± 0.00001 to 0.0017 ± 0.00015; Ni, 0.009 ± 0.001 to 0.042 ± 0.003; Co, 0.068 ± 0.003 to 0.093 ± 0.004; Pb, 0.028 ± 0.001 to 0.064 0.004; Sr, 0.0003 ± 0.00001 to 0.0032 ± 0.0008; Ag, 0.028 ± 0.001 to 0.071 ± 0.004. Values are also given for various forms of P. Spectral analysis showed no V, Be, W, Ge, Li, As, Sb, Cr, Zr, Ti Ba or Sn to be present. SKK

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8 C 388

**Pesticide residues in foodstuffs.**

Anon.

British Food Journal 71 (829) 44-45 & 50 (1969) [En]

An interim report of a scheme operated by food and drugs authorities in England and Wales and intended to give a reliable indication of levels of pesticide contamination of foodstuffs is reviewed. 6 major food groups were sampled: bread, beef (in any form), milk, apples, potatoes and brassicas. Results are summarized and show that of organo-chlorine residues BHC occurs in the greatest number of samples, followed by DDT analogues, with aldrin and dieldrin in the least number. Few samples showed organo-phosphorus residues. Pb was found most frequently on apples, 31.4% containing residues above the reporting limit. Only 3.1% of eggs, apples and tomatoes sampled contained Hg above the reporting limit. Pesticides occurring in imported foods are at higher levels than in home-produced foods. SW

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8 H 824

**Determination of metals in beer and wine by atomic absorption spectrophotometry.**

Weiner, J. P.; Taylor, L.

Journal of the Institute of Brewing 75 (2) 195-99 (1969) [13 ref. En] [Courage, Barclay & Simonds Ltd., London, England]

A Unicam SP90 atomic absorption spectrophotometer was used to determine Cu, Fe, Zn, Pb and Mg in beers and wines. Details of sample preparation and operating conditions are given. The method is rapid, accurate and suitable for routine quality control. DFM

8 J 685
**Screening of compounds for reduction of acidity in citrus fruit.**
Attaway, J. A.; Buslig, B. S.
**Proceedings of the Florida State Horticultural Society 81**: 1-6 (1968) [6 ref. En] [Florida Citrus Commission, Citrus Expt. Sta., Lake Alfred, Florida, USA]

Testing procedures are being evaluated in an effort to find the best technique for determining the ability of various chemical compounds to reduce citrus acidity, particularly that of grapefruit. Promising compounds are being studied both in the laboratory and in the field so that a correlation between laboratory results and actual performance in the field can be established. Active compounds are then screened in the greenhouse, and ultimately on bearing trees in the grove. 1st field tests showed no compound to be as effective as $Pb_3(AsO_4)_2$ although there were compounds which merit further study. AS

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9 C 439
**Lead contamination in mining areas in Western Ireland. II. Survey of animals, pastures, foods and waters.**
Donovan, P. P.; Feeley, D. T.; Canavan, P. P.
**Journal of the Science of Food and Agriculture 20** (1) 43-45 (1969) [5 ref. En] [Public Analyst's Lab., Regional Hospital, Galway, R. of Ireland]

Following mining activities, the incidence of Pb contamination was investigated in the following ways: (i) determination of Pb values in viscera, blood and faeces of dead animals in mining areas; (ii) examination of pastures in areas adjoining mining operations and road dust; and (iii) analysis of foods, milks and waters in the mine vicinity. Pb contents (ppm): cabbage (outer leaves) 0.4-40.0, (inner leaves) 0.05-0.8; milk 0.01-0.14; butter 0.10-1.0; cream 0.10-0.45; parsley 2.0-18.0 and wheat 6.0, were obtained. Pb content of cabbage (outer leaves) is above permissible limits (5 ppm) in some cases, but outer leaves are discarded in preparation. 1 result for parsley is above the permissible limit. Figures for milk, butter and cream are generally satisfactory with regard to health hazards. VJG

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10 A 270
**[New physico-chemical methods of analysis of canned food products.]** Noveye fiziko-khimicheskie metody issledovaniya konservirovanykh pishchevykh produktov. [A book]
Soloveva, E. I.
52pp. (1968) [Ru] Moscow: CINTE-Pishchevaya promyshlennost Price 22 k.

Ashing of preserves to determine the heavy-metal content is described, together with the determination of Pb, Cu, Sn and Cr by photoelectrocalorimetric methods. The determination of Ca and Na by flame photometry is discussed and also the determination of Mg by the complexometric method. Other components are determined by spectral analysis. The fat content determination is also described, as well as a rapid method of determining the air content in the preserve. STI

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11 A 276
**Extraction and atomic absorption analysis of lead in plant and animal products.**
Hoover, W. L.; Reagor, J. C.; Garner, J. C.
**Journal of the Association of Official Analytical Chemists 52** (4) 708-14 (1969) [11 ref. En] [Dept. of Agric. Analytical Services, A&M Univ., Coll. Sta., Texas 77843, USA]

Samples of plant or animal tissue are digested in a mixture of $HNO_3$, $H_2SO_4$, and $HClO_4$. Pb released in the digestion is entrained with $SrSO_4$. The sulphate precipitate is separated from the digest and then converted to the carbonate by agitation with $(NH_4)_2CO_3$ solution. The carbonate precipitate is dissolved in 1N $HNO_3$, and Pb is determined by atomic absorption spectrophotometry. Good recovery of Pb (100 ± 3%) was observed except in samples with high Ca content ($>1\%$). For the latter samples, good recoveries were obtained after separation of the Ca from the digested samples. Moderate quantities of the following elements do not interfere: Al, Fe, P, Sn, Ca, Bi and Tl. Most elements are soluble as sulphates and, hence, do not interfere. The procedure is rugged. Dry samples containing from 0.5 ppm to 1% Pb can be routinely analysed. AS

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11 C 468
**[Some sources of Pb contamination of foods.]**
Sivokv, I. G.; Privalova, K. P.
**Gigiena i Sanitariya 33** (2) 98-99 (1968) [2 ref. Ru] [Kafedra Gigieny Pitaniya Permskogo Med. Inst., Perm', USSR]

Examination of 567 tin-plated steel milk cans manufactured in the Lys'va metallurgical plant in compliance with GOST regulations 5037-66 ('Metal cans for milk and dairy products') showed that dairy products, and also other foodstuffs customarily kept in milk cans by the local population, acquired from the cans the following quantities of Pb: quarg, 0.17-0.8 mg/kg; sour cream, $\leqslant$0.17 mg/kg; milk (held 1 day), $\leqslant$2 mg/l.; water, $\leqslant$0.23 mg/l.; wine $\leqslant$2.66 mg/l. (and also 18-335 mg Fe/l.); fruit juices $\leqslant$4 mg/l. Solder used in can manufacture contained 10% Pb and the 2 grades of tin used contained 0.04 and 0.25%. Dairy products kept 1 wk in cans made with 2nd grade tin contained $\leqslant$5mg Pb/kg. (See following abstr.) SKK

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12 D 734
**Health laws and regulations - Malta.**
World Health Organization
International Digest of Health Legislation 20 (2) 260-66 (1969) [En] [Geneva, Switzerland]

A selection of Maltese health laws and regulations is given including the following which relate to the food industry: Poisonous Metals in Foodstuffs Standard Order, 1967 (Standard Order No. 1 of 1967); Use of Colouring Matter in Foodstuffs Standard Order, 1967 (Standard Order No. 2 of 1967). VJG

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12 R 334
[Contents of macro- and micro-elements in some fish varieties of the world oceans.]
Golvkin, N. A.; Kraynova, L. S.;

Rybnoe Khozyaistvo 45 (4) 60-64 (1969) [7 ref. Ru]
[Leningradskii Tekhnologicheskii Inst. Kholodil'noi Promyshlennosti, USSR]

Determinations were made using emission spectral anaysis of the presence of K, Ca, Mg, Fe, Cu, Zn, Mn, Co, V, Sn, Al and Ag in the muscle tissue of fish from world oceans, whereas Ni, Bi, Pb and Cr were not determined. In the case of identical spp. of sea fish there is a seasonal and regional variation in the content of some elements. The biological effect of some of the elements is described. K affects the elastic properties of the proteins, Mg takes an active part in the ATP hydrolysis, Fe plays the main role in the transport of gases, Cu influences growth and enhances the utilisation of carbohydrates. Organically bound Zn plays an important part in the sexual maturing process of the fish. In comparison to mammals fish have a greater Mn content, but contain no Ni and Pb in comparison to crabs or other spineless sea animals. STI

01 L 40
**[Determination of heavy metals in sugar, molasses and beet pulp.]** Die Bestimmung von Schwermetallen in Verbrauchszuckern, Melassen und Schnitzeln.
Schiweck, H.; Kilcioglu, E.
**Zucker 22 (12) 321-25 (1969)** [13 ref. De, en, fr]

A polarographic method is described for determination of heavy metals in consumption sugars, molasses, pressed pulp and cossettes. The method permits determination of Cu, Pb and Fe, usually even Ni and Zn, in one operation. Before the polarographic determination, the heavy metals are isolated by means of Dowex Chelating Resin A 1 or by direct ashing of cossettes or pulp. The results given show that the content of heavy metals varies by somewhat more than one power of ten. The permissible content of heavy metals in food is discussed. IN

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01 S 48
**Atomic absorption analysis of copper and lead in meat and meat products.**
Dalton, E. F.; Malanoski, A. J.
**Journal of the Association of Official Analytical Chemists 52 (5) 1035-38 (1969)** [9 ref. En]
[Consumer and Marketing Service, USDA, Beltsville, Maryland 20705, USA]

Atomic absorption spectrophotometric determination of Pb and Cu in meat products is described. Organic material is destroyed by dry ashing at 500°C. Cu and Pb levels were in the range 1-5 and 1-10 ppm, respectively. AS

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2 S 97
**[Determination of some trace elements in food products by optical emission spectrography. I. Determination of lead in fresh and preserved meat.]**
Intonti, R.; Cecchetti, G.; Stacchini, A.
**Industria Conserve 43 (2) 146-49 (1968)** [7 ref. It]

A method using optical emission spectroscopy was developed for the estimation of Pb in fresh and preserved meats (20 g samples). Development of the proceedure included formation of a synthetic model substance containing the ash constituents (K, Ca, Mg, phosphate, $Na_2CO_3$, C) of meat in a ratio equal to the mean composition of meat, and choice of optimum exposure times for the analytical couple (Pb and In). A Pb concn. of 1 $\mu$g/g in the starting sample can be determined on 100 mg of its ash. A typical application to a bovine showing symptoms of Pb poisoning is reported. The highest Pb concn. were found in the liver, kidneys and spleen, being 340, 300 and 250 $\mu$g/g respectively. CEB

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3 A 85
**A method for the determination of lead in blood by atomic-absorption spectrophotometry.**
Donovan, P. P.; Feeley, D. T.
**Analyst 94 (1123) 879-83 (1969)** [17 ref. En]
[Public Analyst's Lab., Galway Regional Hospital, Galway, Ireland]

~5 ml of blood are evaporated, and ashed at 500°C. An HCl solution of the ash is neutralised, adjusted to pH 9 and extracted with dithizone in chloroform. The extracted metals are washed out with $HNO_3$, and the acid solution extracted at pH 2.6 with ammonium tetramethylenedithiocarbamate into isobutyl methyl ketone. The absorption of this solution is measured against a blank. Bi does not interfere. Results agree with determinations on aliquot samples by the mixed colour method. Wet oxidation gave slightly higher recoveries than the above method, which is suitable for routine control of Pb in the range 10-100 $\mu$g/100 g. TW

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3 D 135
**['Nevezhis' canned meat. Quality requirements for attested product.]**
Union of Soviet Socialist Republics, Komitet Standartov
**Gosudarstvennyi Standart GOST 5126-69** 4pp. (1969) [Ru]

This standard was introduced on 1 Feb., 1969. It lists permitted constituents, organoleptic properties and assessment, inspection and analysis, packaging, labelling, transport and storage. Composition standards are: NaCl, ≤2%; $NaNO_2$ ≤3 mg/100 g; Sn salts, as Sn, ≤100 mg/100 g; Pb salts, no tolerance; foreign impurities, no tolerance. Period of storage at 0-5°C, ≤2 yr from day of manufacture. SKK

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3 D 136
**[Jam.]**
Union of Soviet Socialist Republics, Komitet Standartov
**Gosudarstvennyi Standart GOST 6442-69** 12 pp. (1969) [Ru]

This standard was introduced on 1 Jan., 1970. It lists characteristics and descriptions of different shapes of fruit jams and jellies, the latter containing agar (Baltic Sea), pectin, or agaroid (Black Sea agar), and regulations on inspection and analysis, packaging, labelling, transport and storage. Composition standards for contents of moisture, reducing substances and ash, and for titratable acidity and max. Cu content are given for all or some of the products. There is no tolerance for Pb and As salts in any of the products and for $H_2SO_3$ derivatives and benzoic acid in jellies. Max. content in other forms of jam is fixed at 100 mg/kg for $H_2SO_3$ derivatives as $SO_2$ and at 0.07% for benzoic acid. Special packaging and storage regulations for products intended for the Arctic, Soviet Far North and remote regions are listed. SKK

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4 A 154
**[Control of lead-tin alloys using atomic absorption spectrophotometry.]**
Laugel, P.; Clauss, C.; Hasselmann, M.
**Annales des Falsifications et de l'Expertise Chimique 62 (686) 191-206 (1969)** [10 ref. Fr]
[Lab. de Chimie analytique, Faculte de Pharmacie, Strasbourg, France]

A spectrophotometric technique for the determination of Pb and Sn in low Sn alloys (98:2) was developed which proved less time-consuming

than the gravimetric method and of comparable accuracy. A 1-g sample of solder was treated with acetic acid and $H_2O_2$ to dissolve all of the Pb. The precipitate of Sn was filtered and dissolved in HCl and $H_2O_2$: the acetic acid-$H_2O_2$ filtrate was treated with HCl and the $PbCl_2$ filtered off. The HCl-$H_2O_2$ solution was mixed with the acetic acid-$H_2O_2$-HCl filtrate, and UV absorption at 225 nm compared with that of a standard solution. Samples of 0.1 g of solder [Pb-Sn 98:2] were dissolved in $HNO_3$ and heated with conc. HCl. to give a solution containing $\sim$20 ppm of Pb. The UV absorption of the solution at 217 nm was compared with that of a standard solution. ML

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4 T 115

**[Determination of mineral elements in vinegars.]**

Villanua, L.; Carballido, A.; Parga, M. C.

**Anales de Bromatologia 21 (2) 117-29 (1969)** [35 ref. Es, en] [Dept. Investigaciones Bromatologicas (C.S.I.C.), Escuela de Bromatologia, Univ. Madrid, Spain]

The processes for the manufacture of vinegar are reviewed historically, and the present legal requirements in Spain and other countries are summarized. A series of 15 samples of Spanish vinegars was examined, and the sulphate, chloride, Cu, Fe, Zn, Pb, As, and ash contents determined. The results were tabulated, and compared with the legal standards; only two of the samples were found not to comply. HSi

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5 C 113

**[Pb loads via food and drink.]** Usuelle Bleibelastung durch Nahrungsmittel und Getränke.

Lehnert, G.; Stadelmann, G.; Schaller, K.-H.; Szadkowski, D.

**Archiv für Hygiene und Bakteriologie 153 (5) 403-12 (1969)** [20 ref. De, en, fr, es] [Inst. für Arbeits- und Sozialmedizin, Univ., Erlangen-Nürnberg, W. Germany]

214 samples of 39 various foods and drinks widely consumed in W. Germany were ashed at low temp. (100-150°C), and Pb contents determined by atomic absorption spectrometry using the method of Lehnert et al. [Med. Welt (1967) 18: 1131]. Practically all the samples contained some Pb. Highest contents ($\mu$g Pb/100 g) were: rice, 133; green peas, 280; salads, 12.5-270; parsley, 543-785; tea, 60-410; and in dehydrated fruits and vegetables. Pb contents ($\mu$g Pb/100 g) for the peeled fruit and the peel respectively of fruits were: apples, 33 and 130; pears, 30 and 80; oranges, 22.6 and 163; and lemons, 19.3 and 83.4. After washing, the Pb contents of 4 types of salad, leeks, parsley, savoy cabbages and grapes were appreciably lower but the investigations did not reveal whether concentration at the plant surface was due to atmospheric pollution or to Pb-uptake from the soil. Pb intakes per capita per day from a selection of foods and drinks are tabulated, giving an estimated daily average of 518 $\mu$g. Vegetable foodstuffs contain more Pb than foods of animal origin. IF

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5 M 440

**[Lipids of leaves and seeds. III. Enzymatic hydrolysis of rice bran lipids.]**

Noda, M.; Kobayashi, K.

**Journal of the Agricultural Chemical Society of Japan 42 (9) 574-80 (1968)** [10 ref. Ja, en] [Coll. of Agric., Prefectural Univ., Kyoto, Japan]

Lipase activity of rice bran increased during storage at 87% RH for 86 days at 25°C. The lipase remained active during storage at -20°C. The lipase activity of rice bran from rice stored for 1 yr was higher than that from newly harvested rice. A lipase preparation, obtained from rice bran after $(NH_4)_2SO_4$ precipitation of the extract, hydrolysed rice bran lipids at pH 5.6-7.0. The activity was stable at 40°C, but declined rapidly at temp. $>$40°C. Ca ions accelerated hydrolysis at low concn.($1\text{-}5 \times 10^{-4}$M), but $Hg^{2+}$, $Pb^{2+}$, $Fe^{3+}$ inhibited activity. Addition of ovalbumin to the incubation mixture activated hydrolysis, whereas inhibition was observed when phytin was added. The lipase had no positional specificity for ester bonds of rice bran triglycerides. MY

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6 H 641

**Determination of lead, zinc, copper, iron, calcium and magnesium in grape musts and wines by atomic absorption spectrophotometry.**

Polo, M. C.; Garrido, M. D.; Llaguno, C.; Garrido, J.

**Revista de Agroquimica y Tecnologia de Alimentos 9** (4) 600-05 (1969) [9 ref. Es, de, en, fr] [Inst. de Fermentaciones Industriales, Madrid, Spain]

Cu, Fe and Zn are determined directly, Ca and Mg after dilution of sample, and Pb after concn. by complexing with ammoniacal pyrrolidine dithiocarbamate and extraction with methyl isobutylketone. Results obtained with 21 samples each of (i) non-fermented grape must, (ii) bottled wines from Andalusia and (iii) red wines from La Rioja are tabulated. (i) contents (mg/l.) were: Zn, 0.04-0.85 in 90% of samples (1 sample reaching 6 mg/l.); Pb, 0-0.35; Cu, 0-0.95 in 80% of samples (max. 4.10); and Fe, 0.6-27.0; (ii) contained 3-4 ppm Zn in 43% of samples, 1-2 ppm Pb and 2-4 ppm Fe in 70% and 80-140 ppm Ca in all but 1 sample; (iii) contained 1 ppm Zn in 76% of samples, $\leqslant$0.5 ppm Pb in 38%, higher Fe concn. than (ii) with isolated values of 7-12 ppm, and 28-75 ppm Ca. The Mg concn. was 65-135 ppm in both (ii) and (iii). RM

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6 H 645

[Metal content of preserved fruit juices.]

Gherardi, S.; Casoli, U.

Industria Conserve 44 (4) 296-99 (1969) [4 ref. It, en, fr, de]

According to a decision taken by the EEC-Codex Alimentarius Committee on fruit juices, a study was carried out by the Italian working group on the Cu, Fe, Zn, Pb, Sn, and Cd contents of industrial fruit juices. Juices of peach, apricot, pear, orange, myrtle berry, lemon, cherry, grape, apple, and blackcurrant, either bottled or canned in 1965, 1966 and 1968 were analysed by

atomic absorption spectrophotometry. As expected, all the products contained levels of trace elements higher than those of corresponding fresh fruits, the increase being particularly large for Sn and Fe in aged canned products. CEB

6 H 735
**The determination of lead in beer.**
Weissler, H. E.; Yadav, K. P.
**Proceedings. American Society of Brewing Chemists** 1969: 51-53 (1969) [2 ref. En] [Falstaff Brewing Corp., St. Louis, Missouri, USA]

A sensitive, though tedious, method for determining Pb in beer involving wet ashing of the sample followed by $HNO_3$ dissolution, dithizone extraction and complexed colour development is described. Adsorbance of the final solution at 530 nm can be plotted against Pb concn. to give a standard ref. curve. Typical recoveries by this method range from 93.8 to 102% of added Pb ion. Commercial beers usually contain $<0.025\ \mu g/ml$ as $Pb^{++}$, but some products exceeding this level are listed. Difficulties in the method due to accidental contamination are emphasized. PEG

6 H 748
**The effect of pH on the precipitation of the anthocyanins of wine as their lead salts.**
Mattick, L. R.; Weirs, L. D.; Robinson, W. B.
**American Journal of Enology & Viticology** 20 (4) 206-12 (1969) [9 ref. En] [Dept. of Food Sci & Technology, Agric. Expt. Sta., Cornell Univ., Geneva, New York 14456, USA]

Anthocyanin pigments were precipitated from samples of young wine of colour ranging from light red to deep violet by neutral lead acetate solution at pH 4.7, 6.1 and 9.4, followed by paper chromatography and evaluation with photoelectric densitometer tracings. 90-95% of anthocyanins, delphinidin and petunidin glycosides were precipitated at pH 4.7; 95% of cyanidin glycosides, 75% of malvidin monoglucosides and 50% of peonidin monoglucosides at pH 6.1; and remaining anthocyanins at pH 9.4. Partial fractionation appeared to be dependent on the structure of the aglycone. A basic medium was required for complete precipitation of the anthocyanins devoid of vicinal hydroxyl groups, malvidin and peonidin glycosides. Calculated recovery of anthocyanins completely precipitated by sequential precipitation at 3 pH levels ranged from 94 to 102%. PEG

7 D 530
**Current food additives legislation - Uruguay.**
Food and Agriculture Organization
**Current Food Additives Legislation** 1969 (127) 12 (1969) [En] [Rome, Italy]

Decree No. 193/969 of 18 April 1969 approving the provisional standard for nationally produced canned peaches in syrup, to which all exports of the product must conform as from 1 June 1969, contains the following provisions regarding additives and contaminants: use of preservatives may be prohibited; use of other substances (provided they are authorized under existing legislation) shall be declared; and the content of any toxic metal shall not be greater than the following % by wt.: Cu 0.001, As 0.00001, Sn 0.01 and Pb 0.0002. [See Sluzbeni List, No. 4, 29 Jan. 1969, Text 36, 150.] VJG

7 D 562
**Current food additives legislation - Italy.**
Food and Agriculture Organization
**Current Food Additives Legislation** 1968 (116) 6 (1968) [En] [Rome, Italy]

Ministerial Decree of 23 Dec. 1967 lays down requirements for DM and ash content, and establishes the following maxima (mg/l.) for substances in wines intended for direct consumption, and in vinegar: Zn, 5 ; Cu, 1; Pb, 0.3; inorganic Br, 1 ; boric acid, 60; sorbitol, 70. [See Gazzetta Ufficiale No. 10, 13 Jan. 1968, 209.] VJG

7 M 597
**Distribution of lead, tin, cadmium, chromium and selenium in wheat and wheat products.**
Morris, E. R.; Greene, F. E.
**Federation Proceedings. Federation of American Societies for Experimental Biology** 29 (2) 500 (1970) [En] [Human Nutrition Res. Division, Agric. Res. Service, USDA, Beltsville, Maryland 20705, USA]

Pb, Sn, Cd, and Cr concn. were determined by atomic absorption spectrometry and Se by a colorimetric method in 9 wheat blends, flour milled from them and products baked from the flours. The average concn. of each element in 5 common hard and 4 soft wheat blends, respectively, were (ppm, dry basis) Pb, 0.50 and 1.00; Sn, 5.6 and 7.9; Cd, 0.10 and 0.07; Cr, 0.38 and 0.37; and Se in the hard wheats, 0.50. Concn. and % recovery, respectively, of each element in baker's patent flour milled from the hard wheat blends was Pb, 0.92 and 127%; Sn, 4.8 and 43%; Cd, 0.05 and 30%; Cr, 0.22 and 35%; and Se, 0.47 and 57%. Bread baked from these flours contained (ppm, dry basis) Pb, 0.47; Sn, 9.8; Cd, 0.22; Cr, 0.38; and Se, 0.41. Sources other than the flour contributed significant amounts of Sn, Cd and Cr to the breads. Pb, Sn, Cd and Cr concn. were also determined in composite samples of 10 different consumer products from 10 cities throughout the USA. Although there was statistically significant variation between geographical regions in the trace element content of some products, the data do not indicate regional variation in trace element nutrition due to consumption of wheat products. AS

8 J 755
**[Trace element content of vegetables and fruits grown in the Saratov region.]**
Pyatnitskaya, L. K.
**Voprosy Pitaniya** 29 (1) 83-85 (1970) [12 ref. Ru]

Mean values with SEM are tabulated for Cu, Mn, Ni, Pb and Cr contents of unspecified numbers of samples of dill, parsley (tops and roots), beet, sorrel, tomato, carrot, cucumber, water-melon, strawberry, raspberry, cherry, blackcurrant, redcurrant, grape, apple and black nightshade (Solanum nigrum). The values rae discussed in relation to Soviet data for other USSR areas. SKK

8 M 696
**[Trace elements in wheat and wheat products.]**
Dunduk, I. G.; Sharamko, E. M.
Vestnik Sel'sko-khozyaistvennoi Nauki 15 (2) 86-88 (1970) [5 ref. Ru, en; de, fr] [Sibirskii Filial Vses. Nauchno-issled. Zerna i Produktov Pererabotki, USSR]

Contents of Fe, Si, Mn, Cu, Mo, Ni, Pb, Ti and Zn are tabulated for whole grain, 70% extraction flour, coarse bran and fine bran of 'Diamant', 'Skala', 'Lyutestsens 758', 'Mil'turum 639' and 'Pirotriks 1477' varieties of wheat grown in Siberia. SKK

10 A 319
**[Determination of trace metal in foods by atomic absorption spectrophotometry. II.]** Bestimmung von Metallspuren in Lebensmitteln und Gebrauchsgegenständen durch Atomabsorptionsspektrophotometrie. 2. Mitteilung.
Roth, F.; Gilbert, E.
Mitteilungen: Rebe, Wein, Obstbau und Früchteverwertung 19 (6) 430-36 (1969 [De, en, fr, es]

Detection of micro-quantities of different metals (Ag, Cu, Pb and Zn) was accomplished by wet decomposition, and extraction of the metals from the resultant ash solution by means of dithizone dissolved in carbon tetrachloride, followed by atomic absorption spectrophotometry during the organic phase. By means of a tenfold enrichment during the organic phase and extrapolation it was possible to determine with certainty 0.002 ppm Ag, 0.003 ppm Cu, 0.01 ppm Pb and 0.002 ppm Zn. The values appeared sufficiently accurate and constant. By measuring the metals during the organic phase the method ensures greater detection efficiency and prevention of interference by anions. It is stated that this method offers 2 considerable advantages compared with spectrophotometric measurement of the dithizone solution in the visible range: the often time-consuming separation of disturbing metals is dispensed with, and the requirements as to the purity of the reagents used are less stringent; and the measuring solution may contain a large surplus of dithizone, so that it can be kept for long periods. [See FSTA (1969 1 7H699 for part I.] AS

10 S 921
**$^{210}$Pb and $^{210}$Po in tissue of some Alaskan residents as related to consumption of caribou or reindeer meat.**
Blanchard, R. L.; Moore, J. B.
Health Physics 18 (2) 127-34 (1970) [26 ref. En] [US Dept. of Health Education and Welfare, Bureau of Radiological Health, Cincinnati, Ohio 45202, USA]

Concn. of $^{210}$Pb and $^{210}$Po in autopsy tissues (lung, liver, kidney, small intestine, blood, muscle, spleen, gonads, thyroid and rib) of Alaskans who ate caribou meat were compared with non-caribou eaters. Of the 8 humans tested, $^{210}$Po concn. was significantly higher in the soft tissues of those who ate caribou shortly before death, however $^{210}$Pb levels were only slightly different. Concn. of $^{210}$Pb in lichens and in caribou (Rangifer farandus) bones of recent (1965-66) samples were compared with $^{210}$Pb and $^{226}$Ra in pre-1951 samples to ascertain the significance of atmospheric nuclear detonations as a source of $^{210}$Pb in the artic. Results showed no apparent increase in $^{210}$Pb concn. in lichens or caribou due to nuclear testing activities. AL

11 D 957
**[Wheat groats.]**
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7672-69 3pp. (1970) [Bg] [Sofia]

This standard, which came into force on 1 July 1970, applies to groats made from wheat of $\geqslant$60% flintiness and $\leqslant$3% added rye. Compositional requirements include: moisture, $\leqslant$14.5%; ash, $\leqslant$1.8% in DM; metallic Fe, $\leqslant$3 mg/kg; metallic Zn, Pb (including salts), Cu, insects and pathogenic or potentially pathogenic micro-organisms, no tolerance. Regulations on appearance, organoleptic properties, sampling, methods of analysis, packaging, labelling, storage, transport and administrative documentation are listed. SKK

11 Q 132
**[Spectrographic assessment of relative contents of trace elements in quails' and hens eggs.]**
Zore, V. A.; Tikhonova, Z. I.
Gigiena i Sanitariya 35 (6) 57-59 (1970) [Ru] [I Moskovskii Med. Inst. imeni I.M. Sechenova, Moscow, USSR]

(i) 13 quails' eggs and (ii) 13 hens' eggs were ashed (shells removed) and ratios of concn. of 19 elements were obtained from comparison of intensity of characteristic lines on pairs of spectrophotographs. Ash ratios were converted into whole egg ratios by assuming 1.4% ash content in (i) and 1% in (ii). (i):(ii) ratios were $\sim$1.2-1.4 for Fe, Zn, Cu, Rh, Ti, Co and V; they were only slightly $>$1 for Ca, Mn, Na, Ta, P and Mg, and they were $\sim$1 for Pb, Si, Al, K, Sr and Cr. SKK

11 T 389
**[Proposed unified method for determination of Cu, Zn and Pb in food additives.]** Ein Vorschlag zur Vereinheitlichung der Bestimmung von Kupfer, Zink und Blei in Lebensmittelzusatzstoffen.
Kröller, E.
Deutsche Lebensmittel-Rundschau 66 (6) 190-92 (1970) [5 ref. De] [Bundesgesundheitsamt, Max von Pettenkofer-Inst., Abteilung Lebensmittelschemie, Berlin-Dahlem, Germany.]

An analytical procedure for the estimation of Cu, Zn, Pb, ash and acid insoluble residues in food additives is proposed. New sensitive and selective reagents are used, and only one weighed sample is required. Cu is determined as diethylthiocarbamate, and Zn and Pb as the 1-(2-pyridyl-azo)2-naphthol(PAN), and Na-4-(2 pyridyl-azo-resorcin(PAR) complexes respectively. A series of tests is described which shows that the metals can be determined sufficiently accurately in the ranges Cu 0.8-80 ppm, Zn and Pb 1.0-10 ppm. HSi

12 D 962
**[Canned meat. Chicken in its own juice.]**
Union of Soviet Socialist Republics, Komitet Standartov SSSR
**Soviet Standard GOST 10010-62 (1970) [Ru] Moscow**

This is a Jan. 1970 re-issue, with modification No. 1 adopted in Oct. 1969, of the standard originally introduced on 1 July, 1962. Regulations on technical requirements, organoleptic and physico-chemical characteristics, methods of inspection and analysis, and marking and labelling, packaging, transport and storage of canned chicken in its own juice (net wt. ≤500 g) are listed. Compositional requirements include: salt content, 1.0-1.6%; Sn content (mg/kg), ≤200; Pb content, no tolerance; presence of ecchymoses, feather stubs or filiform feathers, no tolerance. SKK

12 D 963
**[Canned meat, 'Rusensko Vareno'.]**
Bulgaria, Vurkhoven Suvet po Standartizatsiya
**Bulgarian Standard BDS 7613-69 4pp. (1970) [Bg] Sofia**

This standard, which came into force on 1 July 1970, applies to the canned 'Rusensko Vareno' pig meat dish. Regulations on components, manufacture, appearance and condition of cans and contents, organoleptic properties, composition, sampling, methods of analysis, packaging, labelling, storage, transport and administrative documentation are listed. There is no tolerance for Pb, As and pathogenic or potentially pathogenic micro-organisms. SKK

12 D 964
**[Canned fish. Scad in sunflower seed oil.]**
Bulgaria, Vurkhoven Suvet po Standartizatsiya
**Bulgarian Standard BDS 481-69 5pp. (1970) [Bg] Sofia**

This standard, which replaces BDS 481-51 and came into force on 1 July 1970, applies to canned scad (Trachurus trachurus L.) from summer and autumn catches. Regulations on canning procedure, appearance and condition of cans and contents, organoleptic properties, composition, packaging, labelling, sampling, methods of analysis, storage, transport and administrative documentation are listed for 1st grade and 2nd grade product. There is no tolerance for presence of Pb, As, foreign matter or pathogenic micro-organisms in either grade. Content of aerobic spore-formers should be ≤10/g. SKK

12 D 982
**[Branded brandies. Assortment. Quality requirements for attested products (Ukrainian SSR).]**
Union of Soviet Socialist Republics, Komitet Standartov
**Soviet Standard GOST 5.370-70 4pp. (1970) [Ru] [Moscow]**

This standard, introduced on 1 March 1970, deals with the following brandies, >10 yr old, produced by wineries of the Ukrainian Ministry of the Food Ind. and awarded the State brand of quality: (i) 'Ukraina', (ii) 'Kiev' and (iii) 'Odessa'. Compositional requirements for (i) - (iii) are: ethanol (vol. %), 43 ± 0.3, 42 ± 0.3 and 43 ± 0.3; sugar (as invert sugar, g/100 ml), 7 ± 2, 12 ± 2 and 12 ± 2; Cu (mg/l.), ≤5; Sn (mg/l.), ≤4; Fe (mg/l.), ≤1; Pb, no tolerance; methanol (vol. %), ≤0.1. Regulations on manufacture, appearance, organoleptic properties, inspection and analysis, bottling, packaging, labelling, storage and transport are listed. SKK

12 D 983
**[Branded fortified grape wines. Assortment. Quality requirements for attested products (Ukrainian SSR).]**
Union of Soviet Socialist Republics, Komitet Standartov
**Soviet Standard GOST 5.368-70 6pp. (1970) [Ru] [Moscow]**

This standard, introduced on 1 March 1970, deals with the following fortified wines produced by wineries of the Ukrainian Ministry of the Food Ind. from Crimean grapes, and awarded the State brand of quality: (i) white port-type 'Yuzhnoberezhnyi', (ii) red port-type 'Livadiya', (iii) madeira-type 'Massandra' and (iv) sherry-type 'Massandra'. Permitted grape varieties are listed; addition of other varieties should be ≤15%. Compositional requirements for (i) - (iv) are: ethanol (vol. %), 18.0 ± 0.5, 18.5 ± 0.5, 19.5 ± 0.5 and 19.5 ± 0.5; sugar (as invert sugar, g/100 ml), 10 ± 0.5, 8 ± 0.5, 3 ± 0.5 and 3.0 ± 0.5; titratable acidity (as tartaric acid, g/l.), 4-6 for (i), (ii) and (iv), and 4-7 for (iii); volatile acids (as acetic acid, g/l.) ≤0.9; 'extract' (g/l.) ≥20; sulphurous acid, total and free (mg/l.), ≤200 and ≤20 respectively; Cu (mg/l.), ≤5; Sn (mg/l.), ≤50; Pb, no tolerance; Fe (mg/l.), ≤7; cyano compounds, no tolerance; methanol (vol. %), ≤0.05. Regulations on manufacture, appearance, organoleptic properties, inspection and analysis, bottling, packaging, labelling, storage and transport are listed. SKK

12 D 984
**[Branded dessert grape wines. Assortment. Quality requirements for attested products (Ukrainian SSR).]**
Union of Soviet Socialist Republics, Komitet Standartov
**Soviet Standard GOST 5.369-70 8pp. (1970) [Ru] [Moscow]**

This standard, introduced on 1 March 1970, deals with the following dessert wines produced by wineries of the Ukrainian Ministry of the Food Ind. from Crimean grapes, and awarded the State brand of quality: (i) white Muscat 'Krasnogo Kamnya', (ii) Pino-gri 'Ai-Danil', (iii) white Muscat 'Yuzhnoberezhnyi', (iv) Muscat rose 'Yuzhnoberezhnyi', (v) Tokay-type 'Yuzhnoberezhnyi', (vi) white Muscat 'Desertnyi', and (vii) dessert Kokur 'Surozh'. Permitted grape varieties are listed; addition of other varieties should be ≤15%. Compositional requirements for (i) - (vii) are: ethanol (vol. %), 13 ± 0.5, 13 ± 0.5, 16.0 ± 0.5, 16 ± 0.5, 16 ± 0.5, 13.0 ± 0.5 and 16 ± 0.5; sugar (as invert sugar, g/100 ml), 23 ± 0.5, 24 ± 0.5, 20 ± 0.5, 20 ± 0.5, 20 ± 0.5, 23 ±

5 and 16 0.5; titratable acidity (as tartaric acid. g/l.), 4-6, 3.5-5, 4.5-6, 4-6, 4.5-6, 4-6, 3.5-6; volatile acids (as acetic acid, g/l.), 0.5 and 16 ± 0.5; titratable acidity (as tartaric ⩽0.9; 'extract' (g/l.), ⩾22 for (ii) and ⩾20 for all others; sulphurous acid, total and free (mg/l.), ⩽200 and ⩽20 respectively; Cu (mg/l.), ⩽4; Sn, ⩽20; Pb, no tolerance; Fe (mg/l.), ⩽7; cyano compounds, no tolerance; methanol (vol. %), ⩽0.05; Regulations on manufacture, appearance, organoleptic properties, inspection and analysis, bottling, packaging, labelling, storage and transport are listed. SKK

12 D 1011
[Rice flour.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7673-69 3pp. (1970) [Bg]
[Sofia]

This standard, which came into force on 1 July 1970, applies to rice flour. Compositional requirements are: moisture, ⩽14.5%; ash (insoluble in 10% HCl), ⩽0.1% in DM; titratable acidity (° Neumann), ⩽3; metallic Fe, ⩽3 mg/kg; Zn, Pb, Cu (metallic or as salts), insects, pathogenic and potentially pathogenic micro-organisms, no tolerance. Regulations on appearance, organoleptic properties, sampling, methods of analysis, packaging, labelling, storage, transport and administrative documentation are listed. SKK

1 A 49

**A transistorized radiofrequency polarograph: its use for the determination of tin and lead.**

Harrison, M.; Roughton, C. L.; Surfleet, B.

Analyst 95 (1135) 894-901 (1970) [8 ref. En] [West Cheshire Central Coll. of Further Education, Carlett Park, Eastham, Wirral, Cheshire, UK]

1 C 8

**[Extractability of lead from household utensils made of glazed pottery and enamelled steel, designed for direct contact with food products.]**

Guthenberg, H.; Beckman, I.

Var Föda 1970 (5) 41-56 (1970) [5 ref. Sv] [St. Inst. für Folkhalsan, 10401 Stockholm 60, Sweden]

1 H 19

**[Determination of microelements in wines and musts by means of atomic absorption analysis.]**

Lipis, V. V.; Pchelyntsev, A. M.; Spektor, L. A.

Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii 24 (11) 33-37 (1969) [Ru] [Moldavskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

Zn was determined at 213.9 $\mu$m at a 0.5 mm slit width. The calibration curve was determined from $ZnSO_4.7H_2O$, sensitivity was 0.08 mg/l., setting error ± 5%. Pb was determined at 284.3 $\mu$m. The standard curve was $Pb(NO_3)_2$, sensitivity 0.25 mg/l., setting error ± 40% and was reduced to 10% at a sensitivity of 1-2 mg/l. Cr was determinet at 357.9 standard curve $Cr (NO_3)_2.9H_2O$; sensitivity was 0.5 mg/l. Ni was determined at 341.5 $\mu$m, standard curve $NiSO_4.7H_2O$, sensitivity 0.5 mg/l. The methods are rapid and a determination requires only 1-2 min with the exception of the Cr determination, which takes 2-3 h. STI

2 H 109

**The heavy metal content of fruit juices and carbonated beverages by atomic absorption spectrophotometry.**

Meranger, J. C.

Bulletin of Environmental Contamination and Toxicology 5 (3) 271-75 (1970) [14 ref. En] [Res. Lab., Food and Drug Directorate, Dept. of Nat. Health ind Welfare, Ottawa, Canada]

Because of the large quantity of fruit juice and carbonated beverages consumed in Canada (80 g/day/person), a method for rapid determination of trace heavy metals was investigated. Metal content of 10 fruit juices and 23 carbonated beverages was determined using a Perkin Elmer Model 303 atomic absorption spectrophotometer. Operating parameters are given. All levels were generally within the limits of the Canadian Food and Drug regulations. Lime juice contained 0.24 ppm Cr, 0.85 ppm Cu, 0.40 ppm Ni, 0.30 ppm Pb, 0.26 ppm Mn, 0.97 ppm Zn and <2 ppm Sn; bottled lemonade contained <0.02 ppm Ni, <0.01 ppm Mn, 0.02 ppm Zn, and <2 ppm Sn. Mean deviation of the calibration curve for 72 additions of each metal ranged from 0.8% for Cu to 4.0% lead, showing that measurement by atomic absorption spectrophotometry is reliable. PEG

2 N 100

**[Method for the determination of metal traces in vegetable and animal fats and oils, based on incineration with sulphur.]**

Valentinis, G.

Bollettino dei Laboratori Chimici Provinciali 21 (1) 38-40 (1970) [1 ref. It] [Lab. Chimico Provinciale, Udine, Italy]

A method previously used by other investigators for the analysis of mineral oils was extended to the determination of metals in vegetable and animal fats and oils. 10 to 25 g oil or fat sample is mixed with 1 to 2.5 g sublimated S in a Pt dish and gently heated until burning is complete. The resulting carbonaceous residue is incinerated in an oven at 500-600°C and metals are selectively determined in the ash. The method, tested on olive and seed oils butter and lard containing known amounts of Cu, Pb, Ni, Sn, and Zn gave almost theoretical values. Losses varying from 17 to 37% were observed when the usual calcination methods were used. CEB

2 U 68

**Specification for sodium alginate, food grade.**

India Standards Institution

IS: 5191 10pp. (1969) [En] Price Rs 3.50 [Manak Bhavan, 9 Bahadur AShah Zafar Marg, New Delhi 1, India]

This standard, adopted in July 1969, prescribes the requirements, methods of sampling and tests for sodium alginate for use as a food additive. Aspects covered include description, solubility, identification tests for alginic acid and Na, packing, storage and marking. Compositional requirements are: purity (as $(C_6H_7O_6Na)_n$, % by wt.), 91-106; moisture (% by wt.), max. 20; matter insoluble in water (% by wt.), max. 1.0; viscosity (cP), 30-60; As (mg/kg), max. 3; and Pb (mg/kg), max. 10. Appendices give detailed procedures for determination of purity, moisture, matter insoluble in water, and viscosity. JA

2 U 71

**Specification for sodium carboxymethyl cellulose, food grade.**

India, Standards Institution

IS: 5306 12pp. (1969) [En] Price Rs 4.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes the requirements, methods of sampling and tests for sodium carboxymethyl cellulose (CMC) for use as a food additive. Aspects covered include description, identification, packing, storage and marking. Compositional requirements are: active matter content (% by wt.), min. 99; degree of substitution, max. 0.95; loss on drying at 105°C for 3 h (% by wt.), max. 7; viscosity of a 2% w/w solution (cP), min. 25; As (mg/kg), max. 2; Pb (mg/kg), max. 10; and Fe (mg/kg), max. 100. Appendices give detailed procedures for determination of active matter content, degree of substitution, viscosity, and Fe. JA

2 U 72

**Specification for ascorbic acid, food grade.**

India, Standards Institution

IS: 5342 7pp. (1969) [En] Price Rs 2.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes requirements, methods of sampling and tests for L-ascorbic acid for use as an antioxidant. Aspects covered include description, solubility, identification, specific rotation, pH, packing, storage and marking. Compositional requirements are: purity (as $C_6H_8O_6$, % by wt.), min. 99; loss on drying over $H_2SO_4$ for 24 h (% by wt.), max. 0.4; sulphated ash (%), max. 0.1; As (mg/kg), max. 3; and Pb (mg/kg) max. 10. An appendix gives detailed procedures for determination of purity and sulphated ash. JA

2 U 73

**Specification for butylated hydroxanisole, food grade.**

India, Standards Institution

IS: 5343 11pp. (1969) [En] Price Rs 4.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes the requirements, methods of sampling and tests for butylated hydroxyanisole (BHA). Aspects covered include description, solubility, identification, packing, storage and marking. Compositional requirements are: purity (as $C_{11}H_{16}O_2$, % by wt.), mn. 98.5; mp, 62-65°C; sulphated ash (% by wt.), max. 0.01; As (mg/kg), max. 3; Pb (mg/kg), max. 10; and Fe (mg/kg), max. 5. Appendices give detailed procedures for determination of purity, mp, sulphated ash, and Fe. JA

2 U 74

**Specification for sodium saccharin, food grade.**

India, Standards Institution

IS: 5345 9pp. (1969) [En] Price Rs 3.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes requirements, methods of sampling and tests for sodium saccharin. Aspects covered include description, solubility, identification, packing, storage and marking. Compositional requirements are: purity (as $C_7H_4NNaO_3S$, % by wt. on DM basis), 98-100.5; moisture (% by wt.), max. 15; must pass the tests for alkalinity, benzoate and salycylate, ammonium compounds, and readily carbonizable substances; As (mg/kg), max. 3; Pb (mg/kg), max. 10; and Se (mg/kg), max. 30. An appendix gives detailed procedures for determination of purity, moisture, alkalinity, benzoate and salicylate, ammonium compounds, readily carbonizable substances, and Se. JA

2 U 77

**[Canned foods: Pb determination by the chromate method.]**

Roumania, Oficiul de Stat pentru Standarde

Roumanian Standard STAS 5955/1-68 4pp. (1970) [Ro]

This standard, joint with STAS 5955/2-69 [see following abstr.], and introduced on 1 Jan. 1970, replaces STAS 5955-65 and partly STAS 1807-50. It covers Pb determination by the chromate method in canned foods (vegetables, fruit, meat and fish) containing ≥5 mg Pb/kg. Regulations on reagents, preparation for analysis and procedure are listed. SKK

2 U 78

**[Canned foods: Pb determination by the dithizone method.]**

Roumania, Oficiul de Stat pentru Standarde

Roumanian Standard STAS 5955/2-69 4pp. (1970) [Ro]

This standard, joint with STAS 5955/1-68 [see preceding abstr.], and introduced on 1 July 1970, replaces STAS 5955/65 and partly STAS 1807-50. It covers Pb determination in the canned foods listed in the preceding abstr. by the dithizone method, and is mandatory for litigation. Regulations on apparatus, reagents, preparation for analysis and procedure are listed. SKK

2 U 106

**[Fresh blackberries for processing.]**

Bulgaria, Vurkhoven Suvet po Standartizatisiya

Bulgarian Standard BDS 246-68 5pp. (1968) [Bg]

This standard, which came into force on 1 July 1969 and replaces BDS 24650, covers Black Sea mackerel (Scomber scombrus L.) from spring or autumn catches canned in vegetable oil. Quality and compositional standards include: wt. ratio of fish to liquid part, 80 ± 3:20 ± 3; salt, 1-2%; Cu content, ≤3 mg/kg; Sn content, ≤200 mg/kg; Pb and other heavy metals, no tolerance; pathogens, potential pathogens and toxicogenic microorganisms, no tolerance; saprophytic microorganisms, ≤10/g; contents should not show changes attirbutable to microbial activity. Regulation on manufacture, packaging and labelling, assessment, sampling, analysis, storage, transport and documentation are listed. SKK

2 U 108

**[Wheat starch.]**

Bulgaria, Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard BDS 453-69 3pp. (1969) [Bg]

This standard, which came into force on 1 July 1970 and replaces BDS 453-59, covers (i) 1st quality (edible) and (ii) 2nd quality wheat starch. Quality and compositional standards for (i) and (ii) respectively include:foreign matter, no tolerance for both; other starches, no tolerance and traces allowed; moisture, ≤12 and ≤13%; ash as % DM, ≤0.3 and ≤0.7; ash insoluble in 10% HCl as % DM, ≤ 0.06 and ≤ 0.1; acidity (°Noiman), ≤0.8 and (1.0 and ≤ 1.5 allowed for certain factories); $SO_2$, ≤25 and ≤50 mg/kg; as, Pb, no tolerance for both; Fe, ≤15 and ≤15 mg/kg; Cu, ≤10 and ≤15 mg/kg; moulds, no tolerance for both; pathogens and potential pathogens, no tolerance for both; other micro-organisms, ≤500/g for both. Regulations on manufacture, sampling, analysis, packaging, labelling, storage, transport and documentation are listed. SKK

2 U 110
**['Lecho' canned green peppers in tomato sauce.]**
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7683-69 3pp. (1969) [Bg]

This standard, which came into force on 1 July 1970, covers fresh or preserved green peppers (excluding the 'Kapiya' variety) canned in tomato sauce. Quality and compositional standards include: proportions of peppers and sauce, 50 ± 5 and 50 ± 5%; seeds, peel particles or foreign matter, no tolerance; sugars as invert sugar, $\geqslant 3\%$; salt, $\leqslant 1\%$; tomato sauce DM (by refractometry at 20°C), 10-11%; Sn, $\leqslant 200$ mg/kg; Cu, $\leqslant 8$ mg/kg; Pb, $\leqslant 0.3$ mg/kg; pathogens, toxicogenic and anaerobic micro-organisms, no tolerance; aerobic saprophytic spore-formers, $\leqslant 10$/g. Regulations on manufacture, packaging, labelling, analysis, storage, transport and documentation are listed. SKK

2 U 113
**Specification for butylated hydroxytoluene, food grade.**
India, Standards Institution
IS: 5344 10pp. (1969) [En] Price Rs 3.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes the requirements, methods of sampling and tests for butylated hydroxytoluene (BHT). Aspects covered include description, solubility, identification, packing, storage and marking. Compositional requirements are: purity (as $C_{15}H_{24}O$, % by wt.), min. 99; mp, 69-70°C; sulphated ash (% by wt.), max. 0.01; As (mg/kg), max. 3; Pb (mg/kg), max. 10; and Fe (mg/kg), max. 5. An appendix gives detailed procedures for determination of purity, mp. sulphated ash, and Fe. JA

2 U 114
**[Fruit preserves: stewed fruit.]**
Roumania, Oficiul de Stat pentru Standarde
Roumanian Standard STAS 3164-67 4pp. (1969) [Ro]

This is the 2nd, 1969, edition of the standard introduced on 1 October 1968 and replacing STAS 3164-58. Addition of colouring matter, synthetic sweeteners, preservatives and synthetic aroma substances except vanillin to stewed fruit is prohibited; addition of tartaric, citric and ascorbic acids is permitted. Organoleptic requirements are stated and min. contents of fruit and of soluble substances in syrup are defined for 16 kinds of stewed fruit. Composition standards include further: insoluble impurities, no tolerance; Sn, $\leqslant 100$ mg/kg; Cu, $\leqslant 5$ mg/kg; Pb, no tolerance; potassium sorbate (in mixed fruit only), $\leqslant 0.04\%$; vegetative forms, spores or toxins of pathogens and micro-organisms capable of affecting the product, no tolerance. Regulations on quality tests, methods of analysis, packaging, labelling, storage and transport are listed. SKK

2 U 121
**[Canned foods: canned beans.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Privorov
Soviet Standard GOST 15979-70 5pp. (1970) [Ru] [Moscow, USSR]

This standard, which came into force on 1 Jan. 1971, covers various varieties of green and wax beans, without stems, canned at the milk stage of ripeness. Quality and compositional standards include: bean wt. as % of total contents wt., $\geqslant 60$; pod length, whole 5-9 cm, cut 2-3 cm; salt content, 0.8-1.5%; Sn content, $\leqslant 100$ mg/kg; Pb content, no tolerance; foreign matter, no tolerance. Regulations on manufacture, organoleptic assessment, analysis, packaging, labelling, storage and transport are listed. SKK

2 U 126
**[Canned fish: fried Baltic herring in tomato sauce; quality requirements for attested product.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov
Soviet Standard GOST 5.529-70 6pp. (1970) [Ru] [Moscow, USSR]

This standard, which came into force on 1 June 1970, covers fried Baltic herring in tomato sauce awarded the state mark of quality. Quality and compositional standards include: DM content, $\geqslant 25\%$; acidity, as malic acid, 0.3-0.6%; salt, 1.2-2.5%; Sn, $\leqslant 200$ mg/kg; Cu, $\leqslant 8$ mg/kg; Pb, no tolerance; fish content as % of total, 70-90; foreign matter, no tolerance. Regulations on manufacture, organoleptic assessment, analysis, packaging, labelling, transport and storage are listed. SKK

2 U 129
**[Canned meat: goulash.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov.
Soviet Standard GOST 7987-62 4pp. (1969) [Ru] [Moscow, USSR]

This is a Nov. 1969 edition, including amendment No. 1 of Oct. 1969, of GOST 7987-62 introduced on 1 July 1962 and replacing GOST 7987-56. It covers pork, beef and mutton goulashes. Quality and compositional standards include: meat wt. as % net wt., $\geqslant 70$; salt, 1.0-1.6%; Sn, $\leqslant 200$ mg/kg; Pb, no tolerance; Cu, $\leqslant 8$ mg/kg; foreign matter, no tolerance; the product must comply with official bacteriological and hygiene regulations. Regulations on manufacture, analysis, labelling, packaging, transport and storage are listed. SKK

2 U 161
**Specification for coal tar food colour preparations.**
India, Standards Institution
IS: 5346 6pp. (1969) [En] Price Rs 2.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes requirements, methods of sampling and tests for coal tar food colour preparations. Aspects covered include description, diluents and filling agents packing and marking. Limits for impurities are:

water-insoluble matter (% by wt.), max. 1.0; mixed oxides (% by wt.), max. 1.0; As (ppm), max. 3.0; Pb (ppm), max. 10; and Cu (ppm), max. 10. JA

3 P 484

**Influence of trace minerals on the acid production by lactic cultures.**

Olson, H. C.; Qutub, A. H.

Cultured Dairy Products Journal 5 (2) 12-17 (1970) [16 ref. En] [St. Univ., Stillwater, Oklahoma, USA]

The effects of trace amounts of cartain minerals on acid production by lactic streptococci (Streptococcus lactis and Str. cremoris) was investigated. Preliminary trials showed a beneficial effect of addition of 0.4% sea salt or 0.4 ml seaweed (kelp) extract/10 ml to the pasteurized skim-milk medium. Screening tests with 12 trace elements showed that acid production appeared to be stimulated by addition of $\sim$2 ppm Fe, Mg or Mo or 1 ppm Se, and slightly stimulated by addition of 2-4 ppm Zn or 2 ppm Co to the skim-milk medium prior to incubation at 72°F for $\sim$16 h; up to 8 ppm B, Pb or Li had no effect or were slightly inhibitory while $\geq$4 ppm Cu, I or Hg were definitely inhibitory to acid production. Additional trials with Fe, Mg, Mo and Se and 2 pure cultures led to the conclusion that 2 ppm Fe + 4 ppm Mg + 0.5 ppm Se significantly increases ($P < 0.01$) the rate of acid production by lactic streptococci in skim-milk. CDA

3 U 180

**Methods for the sampling and analysis of acid and rennet casein.**

Australia, Standards Association

Australian Standard AS N60-1970 34pp. (1970) [En] [Standards House, 80, Arthur St., North Sydney, NSW, Australia]

This standard, approved on 24 Sept. 1969, gives recommendations for the determination of: coarse particles of foreign matter, particle size, moisture, fat, pH, and protein (macro-Kjeldahl method) in casein; sediment and extraneous matter, Cu, Fe and Pb in edible acid casein; fixed ash, free acidity and lactose in acid casein; sediment in industrial acid casein; ash in rennet casein; and odour, flavour (edible acid casein only) and colour of casein. Colour standards are provided for untreated and heat-treated acid caseins and for wt-heat-treated rennet casein as well as sediment standards for acid casein. Apparatus, reagents and sampling procedures used in the tests are specified; microbiological methods are not included. BEPC

5 H 708

**[Concentration of lead, fluorine and arsenic in Chilean and French wines.]**

Torres Montalketti, E.

Anales de la Facultad de Quimica y Farmacia, Universidad de Chile 20: 169-71 (1968) [17 ref. Es, en] [Catedra de Bromatologia, Univ., Santiago, Chile]

Concn. of Pb by polarography, F by colorimetry and As by Cribier's method were determined in 30 Chilean (17 red and 13 white) and 31 French (17 red, 12 white and 2 rose) wines. Wide variations (36-500 $\mu$g/l.) were found in Pb contents: F concn. in Chilean wines were generally less than in French wines (0.44-0.63 vs. 0.60-1.10 mg/l.); F concn. in both cases was $<17$ $\mu$g/l. Levels of these elements found were considered to offer no health hazard. MIdeM

5 L 384

**[Mineral content of Hungarian acacia honey varieties and its relationship with the plant and soil.]** Mineralstoffzusammensetzung der ungarischen Akazienhonigarten und deren Zusammenhang mit der Pflanze und dem Boden.

Varju, M.

Zeitschrift für Lebensmitteluntersuchung und -Forschung 144 (5) 308-12 (1970) [9 ref. De, en] [Landesinst. für landwirtschaftliche Qualitätsprüfung, Budapest, Hungary]

The mineral content of 12 acacia honey varieties was studied. 25 g of honey was ashed in a platinum crucible, dissolved in 25 ml of 10% HCl, evaporated in a quartz basin, the residue reconstitued in 2 ml of 25% HCl, and the mineral concn. determined quantitatively by spectrophotometry. The following mean average values in mg/kg were found: $PO_4$ 129, Ca 178, Mg 17, Fe 2.8, B 3.5, Cu 0.29, Mn 0.30, Zn 5.1, Sn 0.2, Pb 0.05, total mineral content 0.033%. A low ash content of 0.1% is characteristic of acacia honey varieties and certain mineral concn. similarities between Leguminosae plants and honey were established. The low concn. of heavy metals is not considered to constitute any danger to health. ±5-15% accuracy of the method is claimed and a comprehensive table of the honey varieties and their respective mineral concn. is given. OA

5 U 279

**[Vermouth.]**

Bulgaria, Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard BDS 909-69 4pp. (1970) [Bg]

This standard, which came into force of 1 July 1970 and replaces BDS 909-52, deals with 7 varieties of white and red vermouth made from white wine by addition of alcohol, sugar, vermouth infusion, tartaric or citric acid and caramel. It contains regulations on quality of materials and on characteristics, compositional standards, packaging, labelling, sampling, analysis, storage, transport and official documentation of vermouths. Standards include: alcohol content (vol. %), 16-18 depending on variety; sugar content (as invert sugar), 15-20% depending on variety; titratable acidity as tartaric acid, 3.5-6.0g/l. (all varieties); volatile acids, as acetic acid, $\leq$1.0 g/l. (all varieties); $SO_2$ content, total $\leq$200 mg/l. free 20 mg/l. (all varieties); other preservatives, no tolerance; artificial colorants, no tolerance; Fe content, 8 mg/l. (all varieties); Cu content, 3 mg/l. (all varieties); As, Pb, Zn, no tolerance. SKK

5 U 281
[Cabernet wine.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7930-70 2pp. (1970) [Bg]

This standard, which came into force on 1 Sept. 1970, deals with red table wine from Cabernet Sauvignon grapes. It contains regulations on winemaking and characteristics, compositional standards, sampling, analysis, packaging, labelling and official documentation of the wine. Standards include: alcohol content, ≥11.5 vol.%; sugar content, as invert sugar, ≤5 g/l.; titratable acidity, as acetic acid, ≤1.5 g/l.; sugar-free extract content, ≥24 g/l.; SO$_2$ content, total ≤200 mg/l., free ≤20 mg/l.; Fe content, ≤10 mg/l.; Cu content, ≤3 mg/l.; Pb, As contents, no tolerance; artificial colorants, not permitted. SKK

5 U 297
[Dairy products. Determination of heavy metals: lead.]
Roumania, Directia Generala pentru Metrologie, Standarde si Inventii
Roumanian Standard STAS 8342/4-69 4pp. (1970) [Ro]

This standard, which came into force on July 1, 1970, specifies the aparatus, reagents and procedure to be used for colorimetric determination of Pb in dried milk, conc. milk products and cheese, using dithizone. Sensitivity of the method is 0.5 $\mu$g Pb. HBr

5 U 301
[Fruit jams.]
Colombia, Instituto Colombiano de Normas Tecnicas
ICONTEC 285 4pp. (1969) [Es] [Apartado Aereo 14237, Bogota 2, Colombia]

This standard, issued in May 1969, deals with fruit jams. It contains regulations on definitions and designations, quality requirements, sampling, packaging and labelling. Composition standards include: min. fruit content for strawberry, pear, plum, pineapple, peach, apple, lulo (Solanum quitoense), tree-tomato (Cyphomandra betacea Sendt.) and mango jams is 45%, for agraz (Vaccinium meridiomale SW.), apricot, blackberry and guava jams it is 40%, and for seville orange and sweet orange marmalades it is 30%; artificial colouring, no tolerance except for strawberry jam for which amaranth, erythrosine and Poncean SX are permitted; artifical aroma substances, no tolerance; antioxidants, ascorbic acid permitted; preservatives, sodium benzoate (max., 0.1%) and potassium sorbate (max., 0.125%) permitted; total soluble solids content, ≥65%; Cu, ≤10 ppm; Pb, ≤2 ppm; As, ≤0.1 ppm. SKK

6 H 831
[Methods of analysis and constituents of wines. Report of the 12th assembly of the sub-committee on the unification of methods of analysis and appreciation of wines, Paris, 20-21 April 1970.]
Anon.
Bulletin de l'Office International du Vin 43 (473/74) 767-98 (1970) [Fr]

A report of discussions at the assembly on the following is given: I. Methods of regulating constituents of wines and musts (citric acid, malic acid, CO$_2$, succinic acid, phosphates, total N, nitrates, Mn, ascorbic acid, sulphates, Pb, sorbitol, chlorides, methanol, Mg, leucoanthocyanins, glycerol and butylene glycol; II. Tracing of preservatives in wines (ethyl pyrocarbonate, sorbic acid) including use of chromatography; III. Tracing of possible additives in wines (caramel, furfural and hydroxyfurfural), synthetic colourings, synthetic sweeteners and meta-tartaric acid; IV. The oenological Codex (second part); V. Enzymes (oxidases), vitamins and N-containing substances; VI. Analysis of sparkling wines; VII. Adoption of limits for certain constituents of wine (diglucosides, SO$_2$, superfluous Na); VIII. Checking and testing of metals, plastics materials, etc. used in oenology. JMS

6 J 785
[Spectral analysis of ashed elements of wild Carpathian berries.]
Trojan, A.V.; Borukh, I. F.
Tovarovedenie 4: 12-15 (1970) [4 ref. Ru]

15 g of fresh berries were placed under an IR lamp for 20 min and then ashed in a muffle-furnace at 400-550°C. % distribution of Ag, Al, Ba, Cu, Fe, Mo, Mg, Mn, Ni, P, Pb, Si, Sr, Ti and Zr in the whole berry, flesh, juice and seed of wild strawberries, raspberries, blackberries, cranberries and bilberries are tabulated. OA

6 U 393
Current food additives legislation - Malta.
Food & Agriculture Organization
Current Food Additives Legislation 1968 (120) 10 (1968) [En] [Rome, Italy]

The Canned Tomatoes Standard Order (1968), states that the content of Ca ions in canned tomatoes should be ≤0.026% of can contents and the addition of NaCl and seasoning and flavouring agents in small amounts is permitted (Ca to be determined by the Official Methods of Analysis of the AOAC). Canned tomatoes should not contain Cu, Pb or As in excess of prescribed limits as published in Standard Order No. 1 of 1967. AB

6 U 399
Current food additives legislation - Netherlands.
Food & Agriculture Organization
Current Food Additives Legislation 1969 (124) 10 (1969) [En] [Rome, Italy]

Definitions, identity standards and labelling rules for salt, kitchen salt, table salt and nitrite brine are issued in the Decree of 16 July 1968 on Salt. Authorized additives for incorporation in salt are listed. The only harmful ingredients tolerated in salt are As (max. 1 mg kg), Pb (max. 0.1 mg kg) and Cu (max. 0.5 mg/kg). AB

6 U 431
Current food additives legislation - South Africa
Food & Agriculture Organization
Current Food Additives Legislation 1969 (129) 18-19 (1969) [En] [Rome, Italy]

Government Notice No. 3228 of 5 Sept., 1969 amends Reg. 3 (2) under the Food, Drugs and Disinfectants Act, No. 13 of 1929. Tolerances for As, Cu, Pb, Zn and Sn in certain beverages and various fruit derivatives such as cordials, syrups, squashes, juices and purees are tabulated. AB

7 A 277
**Environmental researches at the Laboratory of the Government Chemist.**
Lewis, D. T.
Laboratory Practice 20 (1) 24-30 (1971) [29 ref. En, fr, de] [Gov. Chemist's Lab., Cornwall House, London SE1, UK]

The Lab. of the Government Chemist is concerned with quality control of foods, drugs, agricultural products, etc. and carries out numerous analytical investigations relating to the quantitative determination of various additives or contaminants in these groups of industrial manufactures. These activities are described under the following headings: food and environment, covering contamination of food and water with poisonous elements (e.g. Pb, As, Hg) and organochlorine and organophosphorus pesticides; natural food contaminants (e.g. aflatoxins); the chemistry of waters and effluents; fluoridation of water supplies; fission product and radionuclide studies; radon-222; and toxic substances in factory atmospheres. A table lists atmospheric contaminants of factories, threshold limits and methods of estimation. JA

7 H 916
**[Photometric determination of Zn and Pb in water using sulfarazen.]**
Yagodnitsyn, M. A.
Gigiena i Sanitariya 35 (11) 62-63 (1970) [Ru] [Zyryanovskii Svintsovyi Kombinat, Zyryanovsk, USSR]

8 J 948
**Heavy metal content of plants growing on solids contaminated by lead mining.**
Alloway, B. J.; Davies, B. E.
Journal of Agricultural Science (Cambridge) 76 (2) 321-23 (1971) [5 ref. En] [Dept. of Geography, Univ. Coll., Aberystwyth, Cardiganshire, UK]

Results of this study show that heavy metal (Pb, Zn, Cu) concn. in plants are increased on soils with enhanced metal concn. due to pollution. Species and site differences control uptake and all parts of a plant are affected; however, results of a study on the distribution of metals in radish plants demonstrate a tendency for Pb to accumulate in the root. The need for further work on this subject is stressed. AB

8 M 875
**Nutrient composition of selected wheats and wheat products. vi. Distribution of manganese, copper, nickel, zinc, magnesium, lead, tin, cadmium, chromium, and selenium as determined by atomic absorption spectroscopy and colorimetry.**
Zook, E. G.; Greene, F. E.; Morris, E. R.
Cereal Chemistry 47 (6) 720-31 (1970) [8 ref. En]

Mg, Mn, Cu, Ni, Zn, Pb, Cd, Cr and Sn were determined in wheats, wheat blends, flours and flour products. There was significant variation among hard wheats in contents of Ni, Zn Pb, Sn, Cd and Cr. Concn. of all elements but Pb were lower in Baker's patent flour than in hard wheat. Flour was the major source of Mn, Cu, Zn, Mg and Pb in bread, but only ≤50% of Cr, Ni, Sn and Cd could be attributed to flour. Mn, Cu, Zn, Cd and Cr varied significantly in soft wheat. Highly refined short patent flours were generally lower in minerals than straight-grade and cut-off flours from soft wheat. Concn. of Mn, Cu, Zn, and Mg were about the same or lower and Ni, Sn, Cd and Cr higher in cake and crackers than in the flour from which they are made. ∼20-30% of durum wheat minerals were recovered in semolinas prepared from it. Mineral content of macaroni was almost entirely accounted for by semolina. There was little difference between mineral content of bread prepared by conventional sponge-dough and continuous-mix procedures. Air classification vs. conventional milling had no significant effect on flour mineral content. There were significant variations in Pb, Cd and Cr concn. in most samples of consumer products, but geographic location had no discernible effect on the general mineral content of the products. Whole-wheat products contained greater concn. of Mn, Cu, Zn, Mg and Cr than products made from white flour. Se content of wheat blends and products was determined. Se concn. of hard wheat exhibited ∼2-fold variation, but little variation was found in Se content of bread. JA

8 S 1038
**The influence of meatworks effluents on soil and plant composition.**
Wells, N. Whitton, J. S.
New Zealand Journal of Agricultural Research 13 (3) 494-502 (1970) [2 ref. En] [Soil Bureau, Dept. of Sci. and Ind. Res., Lower Hutt, New Zealand]

Effluent irrigation schemes operated by 3 meat works have been investigated. The raw effluents contained significant amounts of N, Cl, P, K, Ca, and S. After settling and oxidation the effluents contained less N, Fe, Co, Ni, Cu, Zn, Mo, and Pb than did the raw effluents. Irrigation of pasture with organic-rich effluents for 15 yr raised N levels and increased base saturation of the topsoils. K and Na accounted for the main increases in exchangeable bases. Analysis of white clover leaves for 23 elements showed that irrigation with effluent raised the levels of N, K, S, and P, but lowered levels of Mn, Cu, and Sr. In ryegrass, effluent irrigation raised the levels of N and K, but lowered levels of B, Mn, and Sr. Analytical figures for effluents, topsoils, white clover, and ryegrass are tabulated. MHEG

8 U 543
**[Canned fish. Caspian sprats in oil: quality requirements of certified products.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov

Soviet Standard GOST 5.630-70 4pp. (1970) [Ru] [Moscow, USSR]

This standard, which came into force on Sept. 1, 1970, applies to canned Caspian sprats of ⩾8 cm in legnth. Cans must contain 1.5-2.5% salt, ⩽200 mg Sn salts/kg, 75-85% fish and 25-15% olive oil. There is no tolerance for Pb salts. The standard covers organoleptic characteristics, test methods, packaging, marking, transport and storage. HBr

8 U 544

**[Canned fish. Natural cod liver: quality requirements of certified products.]**

Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov

Soviet Standard GOST 5.628-70 4pp. (1970) [Ru] [Moscow, USSR]

This standard came into force on Sept. 1, 1970. Canned cod liver must contain 1.5-2.5% salt and ⩽200 mg Sn salts/kg; there is no tolerance for Pb salts. The standard covers organoleptic characteristics, test methods, packaging, marking, transport and storage. HBr

8 U 545

**[Fruit wines, Quality requirements for certified products.]**

Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov

Soviet Standard GOST 5.593-70 4pp. (1970) [Ru] [Moscow, USSR]

This standard, which came into force on Sept. 1, 1970, applies to the following types of wines: 'Naroch' made from fermented apple, pear and raspberry juices; Cherry; Blackcurrant; and Yubileinoe, made from fermented redcurrant, raspberry and blackcurrant juices. Depending on type, the wines must contain 14-16% ethyl alcohol, 14-20 g invert sugar/100 ml, ⩽1.3-1.5 g volatile acids (in terms of acetic)/l., ⩽5 mg Cu, ⩽50 mg Sn, and ⩽10 mg Fe/l., and have a titratable acidity (in terms of malic acid) of 7.0-8.0 g/l.; there is no tolerance for Pb or cyanide compounds. The standard covers organoleptic characteristics, test methods, bottling, packaging, marking, storage, transport and guarantee. HBr

8 U 546

**[Branded brandies. Quality requirements for certified products (Georgian SSR).]**

Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov

Soviet Standard GOST 5.592-70 4pp. (1970) [Ru] [Moscow, USSR]

This standard, which came into force on Sept. 1, 1970, applies to Tbilisi and Eriseli brandies, made from spirits aged 15-20 and 12-15 yr respectively. They must contain 43 ± 0.3% ethyl alcohol, 7 ± 2 g invert sugar/l., ⩽5.0 mg Cu salt ⩽4.0 mg Sn salt ⩽1.0 Fe salts/l., 0.1% methyl alcohol; there is no tolerance for Pb salts. The standard covers technological requirements of raw materials, organoleptic characteristics, test methods, bottling, marking, packaging, storage and transport. HBr

8 U 585

**[Canned sturgeon caviar. Quality requirements for certified products.]**

Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov

Soviet Standard GOST 5.627-70 3pp. (1970) [Ru] [Moscow, USSR]

This standard came into force on Sept. 1, 1970. Canned grain caviar must contain 3.5-4.7% salt, ⩽0.2% methenamine, ⩽0.15% sodium tripolyphosphate ⩽15 mg volatile bases (in terms of $N_2$ /100 g, and ⩽180 mg Sn salts/kg; there is no tolerance for Pb salts. The standard covers organoleptic characteristics, test methods, packaging, marking, transport and storage. HBr

9 J 1112

**[Use of polarography for Cu and Pb determination in vegetable products.]**

Charampowicz, L.; Wozniak, W.

Przemysl Spozywczy 25 (3) 116-20 (1971) [12 ref. Pl, ru, en, fr, de]

(i) Polarographic determination of Cu and Pb in retail packs of tomato puree from 3 Polish vegetable product factories using the Heyrovsky LP 55 polarograph was compared with (ii) colorimetric determination using sodium diethyldithiocarbamate and dithizon respectively. In 12 parallel replicate measurements of Cu and 6 of Pb on each of the 3 types of puree, sensitivity of (i) was 0.05 mg/kg for Cu and Pb, and sensitivity of (ii) was 0.8 mg/kg for Cu and 0.4 mg/kg for Pb. SEM ranges were 0-7.6% for (i) and 0-15.7% for (ii). Duration of analysis was 25 min for (i) and 90 min for (ii). (i) is considered satisfactory and suitable for routine application. SKK

9 P 1526

**A double-bed process for the removal of cationic fission products from milk.**

Glascock, R. F.; Bryant, D. T. W.

Journal of Dairy Research 38 (2) 217-36 (1971) [En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, UK]

A process for the removal of cationic fission products srom milk is described in which no prior acidification is necessary. The milk is treated at 40°C by 2 beds of suitably charged cation exchange resins, 1 of which is of the carboxylic acid type and the other of the sulphonic acid type. On the 1st bed all themetallic cations of the milk are replaced by $K^+$ and H, and on the 2nd the ionic composition is restored. During processing the pH is reduced from 6.8 to ~6.2 and is restored to 6.8 by the addition of alkali metal carbonates to the milk after treatment. On a pilot plant of capacity 1600 l. (30 resin bed volumes)/5-h day it was found that the radiochemical efficiency was ~80% for $^{89}$Sr and 97% for $^{137}$Cs. The process caused some losses of vitamins, especially of thiamine, and an increase in the Pb, Cu and Fe contents all of which, however, were at an acceptable level. Other changes in composition were negligible and enzymic clotting time remained unchanged. Flavour and appearance of

the product were satisfactory and it was satisfactorily both roller- and spray-dried. The process is discussed with reference to an earlier method [See J. Dairy Res. (1968) 35 (2) 257-68 & 269-86] in which prior acidification was necessary. It is concluded that the double-bed process is somewhat more efficient for the removal of fission products and that a full-scale plant would be little or no more expensive to erect and only slightly more expensive to operate. AS

9 U 613
[Jam.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 689-70 5pp. (1970) [Bg]

This standard, which replaces BDS 689-51, came into force on Sept. 1, 1970. Jams shall have ⩾69% DM, ⩾60% sugar (as invert sugar), 0.3-1.3 acidity (as tartaric acid), ⩽10 mg Cu, ⩽100 mg Sn, ⩽0.4 mg As, ⩽0.5 mg Pb, ⩽5 mg Zn, and 10 mg F (all kg, in terms of salts). The standard also covers requirements for taste, colour, odour, appearance, packaging, labelling, sampling, testing, storage, transport and documentation. HBr

9 U 619
[Pasteurized, canned meat, 'Hunter' style.]
Bulgaria, Vurkhoven Suvet po Standartizasiya
Bulgarian Standard BDS 7908-70 4pp. (1970) [Bg]

This standard, which came into force on July 1, 1970, applies to canned, pasteurized 'Hunter'-style meat, made from beef, pork, bacon and seasoning. The product shall have ⩽65% moisture, ⩽45% fat in DM, ⩽2% cooking salt, ⩽20 mg Na/100 g and ⩽200 mg Sn/kg; there is no tolerance for Pb or As. The standard covers can requirements, product appearance, taste and colour, sampling, testing, packaging, labelling, documentation, storage, shelf-life and transport. HBr

9 U 620
[Pasteurized, canned meat, 'Tourist' style.]
Bulgaria, Vurkhoven Suvet po Standartizatsoya
Bulgarian Standard BDS 7909-70 4pp. (1970) [Bg]

This standard, which came into force on July 1, 1970, applies to canned, pasteurized 'Tourist'-style meat made from beef, pork, bacon and seasoning. The product shall have ⩽65% moisture, ⩽35% fat in DM, ⩽2% cooking salt, ⩽20 mg Na/100 g and ⩽200 mg Sn/kg; there is no tolerance for Pb or As. The standard covers can requirements, product appearance, taste and colour, sampling, testing, packaging, labelling, documentation, storage, shelf-life and transport. HBr

9 U 697
Health laws and regulations - South Africa.
World Health Organization
International Digest of Health Legislation 21 (3) 611-32 (1970) [En] [Geneva, Switzerland]

A selection of South African health laws and regulations is given, including the following [illegible] to food hygiene: Government Notice No. 3228 of 5 Sept., 1969 amends regulations made under Section 12 of the Food, Drugs and [illegible] No. 13 of 1929 (tolerance limits (ppm) of As, Cu, Pb, Sn and Zn in certain foods and beverages are listed); Standing regulations under the Animal Slaughter, Meat and Animal Products Hygiene Act 1967 issued in Government Notice No. R. 3505 of 9 Oct. 1969 (provisions relate to abattoir requirements and hygiene, handling, slaughter and inspection, ante- and post-mortem inspections, marks and marking, and equine animal and poultry slaughter regulations). VJG

10 H 1534
**Apple-juice colic.**
Anon.
**Lancet 1971-I (7693) 278 (1971)** [5 ref. En]

Lead-poisoning caused by consumption of acidic fluids (e. g. fruit juices) stored in lead-glazed earthenware containers is briefly discussed. AJDW

10 H 1538
**[Measurement of traces of Cd, Co, Cu, Fe, Mn, Pb and Zn in a few Belgian mineral waters by differential oscillopolarography at an imposed voltage.]**
Es Souabni, A.; Nangniot, P.
**Chimie Analytique 53 (3) 176-182 (1971)** [25 ref. Fr, en] [Fac. des Sci. Agronomiques, Lab. de Chimie Analyt., Gembloux, Belgium]

An oscillopolarographic method for determining Cd, Co, Cu, Fe, Mn, Pb and Zn content in mineral water is described. The method is rapid and sensitive for concn. of ⩾$10^{-7}$M. 11 mineral waters from Spa, Chevron, Spontin and Chaudfontaine contained/l.: 2.0-111.0 μg Cu, 0.4-1.8 μg Cd, 6.1-35.2 μg Pb, 5.4-220.3 μg Zn, 0.01-7.9 μg Co, <0.08-2370.9 μg Mn and 23.2-14 256.9 or <100-18 960 μg Fe (depending on preparation method). RM

10 J 1279
**Direct determination of lead in plant materials by atomic absorption spectrophotometry.**
Fletcher, K.
**Journal of the Science of Food and Agriculture 22** (5) 260-261 (1971) [10 ref. En] [Dept. of Geology, Univ., Vancouver 8, British Columbia, Canada]

Background absorption is shown to result in spuriously high Pb values in analysis of plant digest solutions by atomic absorption spectrophotometry. By measuring absorbance of a spectral continuum in the region of the absorption line a correction can be applied. The corrected values are shown to be in reasonable agreement with values obtained colorimetrically for a wide range of vegetables (edible parts of maize, potato, carrot, bean, cabbage, chard, tomato, beet, cucumber, lettuce). AS

10 U 756
[Modern analytical methods.] Über moderne Analysen-Methoden.
Anon.
Allgemeine Fischwirtschaftszeitung 23 (9) 24 (1971) [De]

A report is given of the 6th Conference of the FAO/WHO Codex Committee on analytical methods held in Bonn-Bad Godesberg in Jan. 1971, to evaluate international reference methods for all foods, additives and foreign matter. This included

fats, oils, mushroom, fruit, vegetables, deep-frozen products, honey, chocolate, fruit juices, dietary foods, preservatives, antioxidants, colouring substances and metallic contaminants. Methods of estimation of $CO_2$, sorbic acid, benzoic acid, PHB-ester, formic acid, hexamethylenetetramine, salicylic acid and boric acid, Hg, Pb, As, Cd, Cu, and Zn were discussed. OA

11 C 210

**[Motorways or leaded bread: vital question of the future.] Nicht Autofahren oder Bleibrot: Lebensfrage der Zukunft.**

Anon.

**Deutsche Müller-Zeitung 69 (13) 311 (1971) [De]**

It is estimated on the basis of regular yearly investigations into Pb and Zn concn. of hair and faeces in adults and children that in 10 yr at the latest there will be a constant and regular incidence of annual deaths from ingestion of Pb-poisoned nutrients. This follows the finding that wheat in the fields of some areas of the USA contained Pb concn. exceeding permissible limits, and was thus rendered unusable for flour and bread. It is proposed that the use of petrol-driven motorcars should be reduced by ~50% and their use for week-end trips to agricultural areas prohibited. OA

11 U 807

**[Sugar products: determination of Pb content.]**

Bulgaria, Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard BDS 7916-70 6pp. (1970) [Bg]

This standard, which came into force on 1 Jan. 1971 and partly replaces **BDS 1554-53**, deals with the colorimetric determination of Pb in sugar products by the diphenylthiocarbazone method. It contains regulations on apparatus, equipment, chemicals, reagents, glassware preparation, sampling, analytical procedure, preparation of standard straight line and calculation of results. Agreement between results of 2 parallel determinations should be ±3%. SKK

11 U 812

**Golden syrup and treacle.**

Standards Association of Central Africa

Central African Standard CAS No. S29:1970 11pp. (1970) [En] Price $0.50. [PO Box 2259, Salisbury, Rhodesia]

This specification covers manufacturing conditions and analytical and microbiological requirements for the production of golden syrup and treacle. Compositional requirements of golden syrup and treacle respectively are: TS (% m/m), 83.0-86.0 and 83.0-86.0; total sugars (as invert, % m/m) 79.0-83.0 and ⩽86.0; reducing sugar (as invert, % m/m), 47.0-50.0 and - ; molasses (% m/m), - and 40.0-60.0; sulphated ash (% m/m), 1.7 and 1.7; $SO_2$ (mg/kg max.) 70 and 70; As (mg/kg max.), 1 and 1; Pb (mg/kg max.), 2 and 2; Cu (mg/kg max.), 10 and 10; Fe (mg/kg max.), 10 and 10. No artificial colouring may be used, golden syrup must be clear and free from haze, the products must be packed in hermetically sealed tin plate or glass containers. These containers must bear labels showing name and true description of product, name and full business address of [illegible] or person for whom the product has been manufactured, net mass, date of canning and certification mark of the Standards Association of Central Africa. An appendix gives the physical test methods and methods of chemical analysis for the above constituents. VJG

11 U 814

**[Sterilized stewed paprika.]**

Bulgaria, Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard BDS 1461-70 4pp. (1970) [Bg]

This standard, which came into force on 1 Jan. 1971 and replaces BDS 1461-53, deals with sliced green, yellow or reddish paprika stewed with ripe tomatoes, packaged in slightly salty tomato juice in cans or glass jars and sterilized. It contains regulations on quality requirements, composition, packaging and labelling, sampling, analysis, storage and transport. Compositional standards include: Cu content, ⩽10 mg/kg; Sn content, ⩽50 mg/kg (jars) or ⩽100 mg/kg (cans); Pb content, ⩽0.3 mg/kg; Zn content, ⩽10 mg/kg; Fe content, ⩽15 mg/kg; As content, ⩽0.2 mg/kg; pathogenic microorganisms, no tolerance. SKK

11 U 815

**[Tomato juice.]**

Bulgaria, Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard BDS 3045-70 3pp. (1970) [Bg]

This standard, which came into force in 1 Jan. 1971 and replaces BDS 3045-57, deals with tomato juice from fresh ripe tomatoes, with or without salt or sugar, packaged in cans or glass bottles and preserved by physical means without application of ionizing radiations. It contains regulations on quality requirements, composition, packaging, labelling, sampling, analysis, transport and official documentation. Compositional standards for 1st and 2nd quality products include: foreign matter, no tolerance; salt ⩽0.5%; acidity (as citric acid), ⩽0.6%; ascorbic acid content (storage for ⩽6 months), ⩾100 mg/kg (1st quality) and ⩾70 mg/kg (2nd quality); Sn content, ⩽10 mg/kg (bottles) and ⩽100 mg/kg (cans); Cu content, ⩽5 mg/kg; Fe content, ⩽15 mg/kg; Pb content, ⩽0.3 mg/kg; As content, ⩽0.2 mg/kg; pathogenic microorganisms, no tolerance; preserving substances and colouring matter, no tolerance; storage life, ⩽1 yr at ⩽18°C. SKK

11 U 820

**[Dessert fruit wines.]**

Bulgaria, Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard BDS 8108-70 3pp. (1970) [Bg]

This standard, which came into force on 1 Jan. 1971, deals with dessert fruit wines of high alcoholic strength and sugar content-produced by complete or partial fermentation of fruit pulp or juice with the addition of water, sugar and grape wine. It contains regulations on quality, composition, organoleptic requirements, sampling, analysis, packaging, labelling, storage, transport and official documentation. Standards for raspberry, blackberry, blackcurrant, strawberry and blueberry wines include: alcohol content, 15-16 vol. %; sugar as invert sugar, 15-16%; sugar-free extract, ⩾16 g/l; titratable acidity as malic acid, 6-9 g/l; volatile acidity as acetic

acid, ≤1.5 g/l.; total $SO_2$, ≤200 mg/l.; free $SO_2$, ≤15 g/l.; Cu, ≤3 mg/l.; Fe, ≤8 mg/l.; Pb, As and Zn, no tolerance; synthetic organic dyes, no tolerance. **SKK**

11 U 832
**Specification for agar, food grade.**
India, Standards Institution
Indian Standard IS:5707-1970 7pp. (1970) [En]
Price Rs 2.50. [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard prescribes requirements and methods of test for food grade agar, i.e. the dried hydrophilic colloidal polygalactoside extracted from red algae (class Rhodophyceae), such as Gelidiella and Gracilaria spp. Agar must be commercially available in bundles consisting of thin, membranous strips or in cut, flaked, granulated or powdered forms; white or pale yellow in colour; odourless or have slight odour and mucilaginous taste; and insoluble in cold water but soluble in boiling water. Compositional requirements are: moisture (% by wt. on drying at 105°C for 5 h), 20; total ash (max. % by wt.), 6.5; acid-insoluble ash (max. % by wt.), 1.0; insoluble matter (max. % by wt.), 1; As (max. mg/kg), 3; Pb (max. mg/kg), 10. Agar must pass test for water absorption, gelatin and starch and dextrins. Packaging and marking, and sampling are also considered. Methods for determining water absorbed, total ash, acid-insoluble ash, gelatin, insoluble matter and starch and dextrins are appended. **VJG**

11 U 842
**[Caramels. Variety: quality requirements of certified products.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov
Soviet Standard GOST 5.124-69 10pp. (1969) [Ru]

This standard applies to 11 types of high-quality caramel, and covers technological requirements of raw materials (moisture in semi-manufactured products ≤2.5-3.0%; contents of reducing substances ≤21.5%; Cu salt contents ≤12 mg/kg; content of HCl insoluble ash ≤0.1%; no Pb salts to be present), test methods (cf. GOST 5904-58 and 5897-58, packaging, labelling, transport and storage. **HBr**

11 U 844
**[Natural fruit juices.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov
Soviet Standard GOST 656-57 6pp. (1970) [Ru]

This standard, which replaces GOST 656-67, applies to juice from 25 different varieties of fruit, sterilized in hermetically sealed containers. All varieties shall contain ≤0.06% sorbic acid, ≤5 mg Cu salts/l. and ≤100 mg SN salts/l. (no Pb salts are permitted). The standard also covers contents of DM, test methods, packaging, labelling, storage (0-20°C at ≤75% RH) and transport. **HBr**

11 U 845
**[Sweetened fruit juices.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov
Soviet Standard GOST 657-70 6pp. (1970) [Ru]

This standard, which replaces GOST 657-57, applies to juices from 28 varieties of fruit, sweetened with sugar or sugar syrup, and sterilized in hermetically sealed containers. All varieties shall contain ≤0.3-0.5% alcohol (depending on quality), ≤0.06% sorbic acid, ≤5 mg Cu salts/l., ≤100 mg Sn salts/l., and no Pb salts. The standard also covers contents of DM, acidity, test methods, packaging, labelling, stotage (0-20°C at ≤75% RH) and transport. **HBr**

11 U 847
**[Fruit squashes.]**
Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov
Soviet Standard GOST 16366-70 4pp. (1970) [Ru]

This standard applies to juices from 16 different varieties of fruit, containing finely divided pulp, sweetened with sugyr or sugar syrup, and sterilized in harmetically sealed containers. All varieties shall contain ≤0.4% alcohol, ≤0.06% sorbic acid, ≤5 mg Cu salts/l., ≤100 mg Sn salts/l., and no Pb salts. The standard also covers contents of DM, total acidity, pulp contents, test methods, packaging, labelling, storage (0-20°C at ≤75 RH) and transport. **HBr**

11 U 858
**[Citric acid for food purposes.]**
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 8142-70 10pp. (1970) [Bg]

This standard, which came into force on 1 July 1971, deals with citric acid for food purposes obtained by oxidative sugar fermentation in molases using Aspergillus niger. It contains regulations on technical requirements, sampling, analytical methods, packaging, labelling, storage, transport and official documentation. Standards include: citric acid content ≥98.5%; ash, ≤0.5%; free $H_2SO_4$, ≤0.05%; As content, ≤0.00007%; heavy metal content (sulphide test), ≤0.0033 mg Pb equivalent/g. **SKK**

12 C 231
**[Examination of lead content in plants.]**
Bleigehalt in Pflanzen untersucht.
Erwerbsgärtner 25 (33) 1540 (1971) [De]
Anon.

Investigations carried out by the Swiss Confederate Research Institute for Agricultural Chemistry showed that absorption by plants of Pb compounds from motor-car exhausts in the immediate vicinity of roads is influenced by weather conditions and plant structure. In yr with low atmospheric pressure the Pb content was distinctly lower than in dry yr. It was also established that plants with large-surface area, rough, hairy and indented leaves contain more Pb than plants with leaves which are smooth, waxy and inclined upright. Hardly any Pb was found in plant roots. In further experiments cattle were fed with pressed blocks of grass which was grown by motorways. A large part of Pb so ingested was excreted in faeces and urine. **OA.**

12 J 1476

**Effect of soil fumigation and six soil water regimes on mineral content of carrots.**

Maurer, A. R.; John, M. K.

Canadian Journal of Plant Science 51 (4) 275-281 (1971) [12 ref. En] [Res. Sta., Dept. of Agric., Agassiz, British Columbia, Canada]

Mineral content of carrots grown in a Lumbum muck soil was affected by soil fumigation and by soil water regime. Foliage of plants grown in fumigated soil had greater levels of P, Ca, Mn, Fe and Zn but lower levels of N and Al, while roots had greater levels of P, Na, Mn, Zn, Cu and Pb and a lower level of N in fumigated than in nonfumigated soil. Plants provided with ample soil water tended to have higher levels of P in roots and in foliage than plants grown under a dry regime. Cu and Pb levels in foliage were affected in the opposite manner. AS

12 P 2061

**Cadmium, copper, iron, lead, manganese, and zinc in evaporated milk, infant products, and human milk.**

Murthy, G. K.; Rhea, U. S.

Journal of Dairy Science 54 (7) 1001-1005 (1971) [25 ref. En] [Dept. of Health, Education and Welfare, FDA, Cincinnati, Ohio 45226, USA]

Trace minerals were measured by atomic absorption spectrometry in market samples of 4 brands of evaporated milk and 2 modified milk-, 1 soya flour- and 1 lamb meat-based formulae, and in samples of human milk from 13 mothers. Average levels of the various elements in market samples and human milk respectively were as follows (ppm): Cd, 0.020-0.042 and 0.019; Cu, 0.09-1.49 and 0.24; Fe, 0.82-19.01 and 0.84; Pb, 0.33-0.87 and 0.012; Mn, 0.18-2.68 and 0.12; and Zn, 2.95-8.60 and 1.34. Evaporated milk contained the most Pb, whereas formulae based on soya flour or lamb meat were highest in the other trace elements. Dextrimaltose contributed insignificant amounts of trace elements to a formula prepared from evaporated milk. Results are discussed in relation to trace element requirements of infants. CDA

12 P 2083

**[Experimental feeding of dairy cows with hay contaminated with Pb from motor car exhaust gases. I. Accumulation of Pb in various organs and its elimination via excreta.]**

Bovay, E.; Hofmann, W.; Zuber, R.; Küpfer, U.; Gisiger, L.; Blanc, B.

Schweizerische Landwirtschaftliche Forschung 9 (2) 159-168 (1970) [18 ref. Fr, de, en, it] [Sta. Federale de Recherches Laitieres, Liebefeld-Berne, Switzerland]

After a pre-experimental conditioning period, 3 cows were fed exclusively for 3 wk with (i) grass pellets containing 10 ppm Pb in the DM followed for 5 wk with (ii) diced pellets containing 100 ppm Pb made from grass cut in an area adjoining a highway having high traffic density. Pb contents of pooled samples of faeces and urine of the 3 animals are tabulated for three 10-day experimental periods and compared with results for a control animal, together with various experimental factors (milk yield, feed consumption, etc.). Pb contents of meat, bone, liver and kidneys of the animals at slaughter are tabulated; highest average value (1.655 mg Pb/kg fresh wt., 21 × that of the control) was found in liver but in absolute terms the largest amount accumulated in bone, particularly the pelvic girdle, with possibly a large proportion also retained in unexamined organs and tissues, e.g., adipose tissue and the alimentary tract. [See also following abstr.] BEPC

12 P 2084

**[Experimental feeding of dairy cows with hay contaminated with Pb from motor car exhaust gases. II. Accumulation of Pb in blood and udder and its effects on milk secretion.]**

Blanc, B.; Hofmann, W.; Bosset, J.; Graber, H.; Liechti, D.; Bovay, E.

Schweizerische Milchzeitung 97 (63) 495-496 (1971) [9 ref. Fr, de]

Pb contents of blood of 3 experimental cows fed (ii) (see preceding abstr.) for 4 wk are tabulated for 2-3 day sampling intervals; highest mean value was 0.252 mg/l. compared with 0.108 mg/l. for a control animal. Mean Pb content of the milks rose to 0.064 mg/l. vs. 0.024 found in milk of a herd in an alpine district remote from motor traffic. At slaughter, average Pb content of udders was 10 × that of control animals. BEPC

12 U 914

Specification for lecithin, food grade.

India, Standards Institution

Indian Standard IS: 5055 13pp. (1969) [En] Price Rs 5.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in April 1969, prescribes the requirements and methods of sampling and test for lecithin for use as a food additive. Aspects covered include description, solubility, identification tests, gossypol content, packing and marking, sampling and tests. Compositional requirements are: purity (as acetone-insoluble residue, % by wt., min.), 50; moisture (% by wt., max.), 2; P (% by wt., min.), 3.5; benzene insoluble matter (% by wt., max.), 0.3; acid value (max.), 36; As (mg/kg, max.), 3; and Pb (mg/kg, max.), 10. Appendices give detailed procedures for determination of total gossypol, purity, moisture, P, benzene insoluble matter and acid value. JA

12 U 917

Specification for potassium nitrite, food grade.

India, Standards Institution

Indian Standard IS: 5057 6pp. (1969) [En] Price Rs 2.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in April 1969, prescribes the requirements and methods of sampling and test for potassium nitrite for use as a food preservative. Aspects covered include description, solubility, identification tests, packing, storage and marking, sampling and tests. Compositional requirements are: purity (on dry basis, % by wt., min.), 97; loss on drying when dried over silica gel for 4 h (% by wt., max.), 1; As (mg/kg, max.), 3; and Pb (mg/kg, max.), 10. An appendix gives a detailed procedure for determination of purity. JA

show the types and amounts of substances migrating from the materials tested. The method is said to give a picture of the actual contamination of foods by the materials tested. LA

12 U 918
**Specification for sodium citrate, food grade.**
India, Standards Institution
Indian Standard IS: 5058 7pp. (1969) [En] Price Rs 2.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in April 1969, prescribes the requirements and methods of sampling and test for sodium citrate for use as a food preservative. Aspects covered include description, solubility, identification tests, oxalate test, readily carbonizable substances test, packing, storage and marking, sampling and test. Compositional requirements are: purity (on dry basis, % by wt., min.), 99; moisture (% by wt., max.), anhydrous 1, dihydrate 13; must pass the alkalinity test; As (on dry basis, mg/kg, max.), 3; and Pb (on dry basis, mg/kg, max.), 10. Appendices give detailed procedures for determination of purity and moisture and for the alkalinity test. JA

12 U 930
**[Orange juice.]**
Kuwait, Ministry of Commerce and Industry, Department of Industrial Affairs, Standardization and Metrology
Kuwait Standard KSS 2/1970 3pp. (1970) [Ar]

This standard, which applies to natural orange juice, conc. orange juice and orange beverages, establishes max. contents of deleterious elements, such as As (⩽0.1 ppm), Pb (⩽2 ppm), Cu (⩽10 ppm) and Zn (⩽300 ppm), min. solids contents and acid content range. Natural orange juice shall not contain colouring agents, artifical sweeteners or preservatives. Pasteurized or conc. orange juice may contain preservatives, colouring agents or taste improvers within certain limits. Can requirements, labelling and transport of frozen juices (which must be sold within 6 months of processing) are also covered. JKM

12 U 939
**[Edible starch.]**
Kuwait, Ministry of Commerce and Industry, Department of Industrial Affairs, Standardization and Metrology
Kuwait Standard KSS 6/1970 3pp. (1970) [Ar]

The standard applies to edible starch derived from rice, wheat, potatoes and sweet potatoes. The natural characteristics of the product, which shall be free from fungi or harmful elements such as Pb or As, must be retained. Packaging and labelling requirements are listed. JKM

1 C 9

**Epidemiological and experimental aspects of lead and mercury contamination of food. [A review]**

Clarkson, T. W.

Food and Cosmetics Toxicology 9 (2) 229-243 (1971) [57 ref. En] [Dept. of Radiation Biol. and Biophysics, Univ., Rochester, New York 14620, USA]

The subject is reviewed under the headings: pathways of heavy metals into human food; the chemical state of heavy metals in food; significance of blood levels of Pb and Hg; no-effect levels of Pb and Hg in food; antidotes of heavy metal poisonings; and mechanisms of excretion. VJG

1 H 47

**[Lead determination in water by atomic absorption spectrophotometry.]**

Kisfaludi, G.; Henry, C.; Jourdain, J.-L.

Chimie Analytique 53 (6) 388-390 (1971) [3 ref. Fr, en] [Inst. de Recherches Hydrologiques, Nancy, France]

2 methods of Pb determination in water by atomic absorption spectrophotometry were investigated: (i) by direct sample spraying, and (ii) after extraction by hexone (methyl isobutyl ketone), which involves complex formation with $NH_4$ pyrrolidine dithiocarbamate, does not require a separating funnel, the upper layer rising into the narrow neck of a calibrated flask and being sprayed into the flame without removal of the aqueous layer. (i) is suitable for determining 0.3-3.0 mg Pb/l, (ii) for 0.003-0.5 mg/l., including drinking water. RM

1 S 41

**A survey of the arsenic, copper and lead contents of pig and other animal livers.**

Peden, J. D.

Journal of the Association of Public Analysts 8 (1) 14-19 (1971) [6 ref. En] [County Analyst's Lab., County Hall, Taunton, Somerset, UK]

120 random samples of liver were examined for As, Cu and Pb. <0.1 ppm of As was found in 104 samples, <1.0 ppm (0.1-0.9 ppm) in 11 samples and 5 contained >1.0 ppm. Cu content of edible livers was: 98 samples, 0-20 ppm; 30, 20-50 ppm; 5, 5-100 ppm; 2, >100 ppm. Pb content was: 134 samples, 0-0.2 ppm; 1 sample, >2.0 ppm. The max. limit for As in foods intended for human consumption is fixed at 1.0 ppm. Levels of Cu >50 ppm are regarded as excessive. 1 sample was found to contain Pb in excess of the limit of 2.0 ppm laid down in the food regulations. VJG

2 C 33

**Embryotoxicity of chemical contaminants of foods. [A review]**

Clegg, D. J.

Food and Cosmetics Toxicology 9 (2) 195-205 (1971) [59 ref. En] [Food Advisory Bureau, Food and Drug Directorate, Carlingwood Plaza, Carling Avenue, Ottawa, Ontario, Canada]

A brief review is given of some contaminants that may occur in foodstuffs: mycotoxins (aflatoxins), metals (Zn, Cd, Ca, Se, Pb, Hg, $^{90}$Sr), nitrosamines, pesticides (2,4,5-T) and polychlorinated biphenyls. It indicates that in the majority of cases embryotoxicity or teratogenicity are toxic hazards unlikely to occur in practice as a result of such contamination. The possible exception is Hg and in particular methylmercury. VJG

2 C 40

**Source and occurrence of environmental contaminants. [A review]**

Somers, E., Smith, D. M.

Food and Cosmetics Toxicology 9 (2) 185-193 (1971) [47 ref. En] [Food and Drug Directorate, Iunney's Pasture, Ottawa 3, Ontario, Canada]

Sources and occurrence of the following food contaminants: trace elements (Pb, Cd, Hg and As); pesticides; polychlorinated biphenyls; and chlorodioxins, are reviewed. VJG

2 C 52

**Lead quantities in plants, soil, and air near some major highways in Southern California.**

Page, A. L.; Ganje, T. J.; Joshi, M. S.

Hilgardia 41 (1) 1-31 (1971) [27 ref. En] [Dept. of Soil Sci. & Agric. Eng., Univ., Riverside, California, USA]

Cauliflower, strawberries, cabbages, tomatoes, oranges, lemons, wheat, lima beans, red peppers, sugar beets, carrots, parsnips, and lettuce grown at various distances from highways in S. California were examined for Pb. Plants grown within 150 m of the highway contained more Pb than those grown beyond that distance. Greatest Pb accumulation occurred in leafy crops grown within 50 m of the highway. Root, pod, and husk crops were not substantially influenced by proximity to the highway. Rough, hairy-leaved plants accumulated more Pb than smooth-leaved plants. Direction of prevailing wind had a significant effect. Traffic density of <5000 motor vehicles/day gave relatively low Pb accumulation, 35 000/day substantial Pb accumulation. Careful washing of plant parts reduced Pb content, more so in smooth-leaved plants than rough-leaved plants. The study demonstrated that Pb accumulation in and on plants near highways of S. California was principally caused by aerial deposition and not by absorption from Pb-contaminated soil. OA

2 F 82

**[Contamination of foods by packaging materials and cooking utensils.]**

Sampaolo, A.; Rossi, L.; Gramiccioni, L.; Esposito, G.; Binetti, R.

Imballaggio 22 (187) 3-6 (1971) [It]

A study was made of the contamination of foods by various packaging materials and cooking utensils, including stainless steel, tin or Al containers, earthenware utensils, metal or glass cooking vessels lined with PTFE), PVC, polyethylene, polypropylene, polystyrene, ABS, regenerated cellulose films, various resins, paper and glass containers and their lined metal caps. The action of the foods was simulated by the use of solvents: water, 5% acetic acid, 20% ethanol or n-heptane. The solvent were left in contact with the materials for times ranging from 15 min to 10 days at temp. ranging from 50°C to >100°C. The results, given in a series of detailed tables,

show the types and amounts of substances migrating from the materials tested. The method is said to give a picture of the actual contamination of foods by the materials tested. **LA**

2 P 122
**[Lead content in milk and milk powder.]** Bleigehalt von Milch und Milchpulver.
Stelte, W.
**Zeitschrift für Lebensmitteluntersuchung und -Forschung 146 (5) 258-262 (1971)** [8 ref. De, en] [Inst. für Ernährungswissenschaft, Justus Liebig-Univ., Giessen, W. Germany]

40 milk and milk powder samples from regions of W. Germany were analysed for Pb content by using inverse voltammetry (electrode stripping). The ranges of Pb found were: milk (14.5-67 ng/ml); milk powder (125-560 ng/g); and skim-milk powder (45-750 ng/g). One sample reached a value of 394 ng/ml for milk and 3280 ng/g for milk powder but this was due to faulty processing at one particular plant. Although these levels are not individually harmful added to the total dietary intake of lead they could well form a significant contribution. **BM**

2 P 141
**Effect of using lead polluted air on composition of spray dried dairy products.**
Cornell, D. G.; DeVilbiss, D. E.; Pallansch, M. J.
**Abstracts of Papers. American Chemical Society 162: AGFD 46 (1971)** [En] [E. Marketing and Nutr. Res. Div., Agric. Res. Service, USDA, Washington, DC 20250, USA]

The Pb content of samples of experimental spray-dried dairy products made in a pilot plant was found to range rom 1 to 0.05 μg/g powder. Square wave and fast scan polarography were also used to determine the amount of Pb in milk before and after drying and in the air used for its manufacture. These data showed that $\sim$50% of the Pb in air used for spray-drying is trapped in the product. Therefore, if the level of Pb pollution in the earth's atmosphere continues to rise, more concern about the quality of the air now used to dry food products may become necessary. The Pb contents of a few commercial samples of nonfat dry milk were determined and the results are discussed. **AS**

2 R 63
**Report of a survey of fish products for metallic contamination undertaken in South West England and South Wales during early 1971.**
Taylor, D. J.
**Journal of the Association of Public Analysts 9 (3) 76-85 (1971)** [2 ref. En] [Scientific Adviser's Dept., Canynge Hall, Bristol, BS8 2PR, UK]

This synopsis of a paper read at the Annual General Meeting of the Association of Public Analysts at Matlock, May 1971, reports work carried out by 8 Public Analysts' Laboratories in the South West in a collaborative study of metallic contamination of fish products. 209 fish products (including 48 samples of tuna fish) were examined for Hg, methyl mercury, As, Cd, Cu, Zn and Pb. The following ranges were obtained (ppm): Hg, 0.1-0.9; As, $<$0.5-20; Cd, 0-6; Cu, 0-50; Zn, 0-50; Pb, 0-5. Tuna fish levels (ppm) were: Hg, 0.1-0.8, mean level 0.3; As, $<$0.5; Cd, $<$0.2; Cu, $<$3; Zn, $<$20; Pb, $<$1.3. Most of the Hg was in the form of methyl mercury compounds. **VJG**

2 U 94
**[Fruit and berry squashes.]**
**Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov**
**Soviet Standard GOST 16366-70 4pp. (1970)** [Ru] [Moscow, USSR]

This standard, which came into force on 1 Jan., 1972 covers juices with finely comminuted pulp prepared from fruit and berries of 16 individual spp. (cowberry, plum, cultivated apple, apricot, quince, "Al'fa" grape, cherry, bog bilberry, blackberry, cornelian cherry, redcurrant, gooseberry, small cranberry, peach, bilberry, and apple) with the addition of sugar or syrup (cowberry, plum and apple also without sugar or syrup), packaged in glass jars, cans, or small bottles and Al containers, and sterilized. General standards are given for appearance, taste, aroma and colour, and individual standards for DM content (refractometer), total acidity (as malic acid) and % pulp. The following common standards apply: alcohol, $\leq$0.4%; sorbic acid, $\leq$0.06%; Cu, $\leq$5 mg/l.; Sn (canned product), $\leq$100 mg/l.; Pb (canned product), no tolerance; foreign matter, no tolerance. Regulations on analysis, packaging, labelling, storage and transport are listed. [See also FSTA (1971) 3 11U844 & 845.] **SKK**

2 U 98
**[Fruit, berry, rhubarb and melon compotes.]**
**Union of Soviet Socialist Republics, Komitet Standartov, Mer i Izmeritel'nykh Priborov**
**Soviet Standard GOST 816-70 6pp. (1971)** [Ru] [Moscow, USSR]

This standard came into force on 1 Jan. 1972 and replaces GOST 816-55. It covers compotes prepared from 2 apricot varieties, cherry plum, quince, grape, cherry, pear, melon, strawberry, fig, gooseberry, cornelian cherry, kumquat, raspberry, tangerine, peach, rhubarb, 7 plum and greengage varieties, sweet cherry, blackcurrant, bilberry, feijoa and apple, packaged in syrup in jars or cans, and sterilized. Individual standards are given for % content of raw material in finished product and for min. DM content of syrup (refractometer) in higher grade and table grade products, as well as general standards for organoleptic characteristics of the different compotes. The following common standards apply: Sn (canned product), $\leq$150 mg/kg; Cu, $\leq$5 mg/kg; Pb (canned product), no tolerance; foreign matter, no tolerance (but addition of citric or tartaric acid to syrup for1 apricot variety, white sweet cherry and pear is permitted). Regulations on technological requirements, analysis, packaging, labelling, storage and transport are listed. **SKK**

2 U 100
**Specification for calcium saccharin, food grade.**
**India, Standards Institution**
**Indian Standard IS: 5709-1970 8pp. (1970)** [En]
**Price Rs. 2.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]**

This standard, adopted in July 1970, prescribes the requirements and methods of sampling and test for food grade calcium saccharin. Requirements cover solubility in water, identification, composition, packaging, storage and marking, sampling and tests. Compositional requirements are: purity (as $C_{14}H_8CaN_2O_6S_2$, on dry basis, % by wt.), ⩾95; moisture (% by wt.), ⩽15; readily carbonizable substances, to pass prescribed test; benzoate and salicylate, to pass prescribed test; As (mg/kg), ⩽3; Pb (mg/kg), ⩽10; Se (mg/kg), ⩽30. Appendices detail methods for determination of purity, moisture and Se, and tests for readily carbonizable substances and benzoate and salicylate. JA

2 U 108

**Specfication for lactose, commercial.**

India, Standards Institution

Indian Standard IS: 1000-1959 Amendment No. 1 1pp. (1971) [En] [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This amendment, issued in Feb. 1971, to the standard adopted in 1959, adds the following new clause: '3.1.1 The product [lactose] shall be processed and packed in premises maintained under hygienic conditions. It shall also be stored and distributed under hygienic conditions.' The original standard prescribes the requirements and methods of test for commercial lactose. Requirements cover particle size, composition, quality of test reagents, packing and marking. Appendices detail methods for: sampling of lactose, testing for acidity, and determining total ash, fat, N, lactose, specific rotation, Pb and As. JA

3 C 71

**[Lead from motor exhaust gases as a factor of atmospheric pollution. Its accumulation in vegetation along roads with high traffic density.]** Das Blei aus Motorfahrzeugabgasen. Seine Akkumulation auf Pflanzen und die damit verbundenen Gefahren.

Zuber, R. ; Bovay, E.; Tschannen, W.

Schweizerische Landwirtschaftliche Monatshefte 49 (6/7) 249-261 (1971) [15 ref. De, fr, it, en] [Eidgenössische Forschungsanstalt für Agrikulturchemie, Liebefeld-Bern, Switzerland]

A study was made in Switzerland in 1969 of the Pb contamination (arising from exhaust gases of motor vehicles) of plants grown 2-1000 m from 2 high traffic density roads (11 000 and 20 000 vehicles/day). Controls were obtained from traffic-free areas. Plants studied included cereals, potatoes, cabbage, cauliflower, onions, lettuce, runner beans, spinach, endives, dwarf beans, tomatoes and a variety of plants used for feeding animals. Individual parts of the plants (e.g. leaves, grains, pods, stalks, straw) were examined separately. Pb was determined in both washed and unwashed samples. Main conclusions reached from the results obtained are as follows. Pb deposits were greatest on plants grown near high traffic-density roads (>100 ppm of DM in some cases) and decreased with increasing distance from roads. Pb contents varied with traffic vol., direction of prevailing wind, amount of rainfall, Pb content of soil (either natural or introduced in fertilizers), type of leaves on plants (large hairy leaves retained more Pb than small smooth leaves), etc. Washing removed 30-65% of Pb, confirming the hypothesis that Pb is deposited from the atmosphere onto plant surfaces. A further study examined the Pb content of milk, faeces, urine, blood and various organs of cows which had been fed Pb-contaminated (99 ppm) hay for periods up to 36 days. A large proportion of the ingested Pb was eliminated in the faeces and urine, but some accumulated in the investigated organs. Small amounts (0.04 and 0.07 ppm after 2 separate feeding periods of 10 days each) were found in milk. HSi

3 S 317

**[Residues in meat, their occurrence, significance and determination within the framework of official meat inspection.]** Rückstände im Fleisch, Vorkommen und Bedeutung sowie ihre Beurteilung im Rahmen der amtlichen Fleischuntersuchung.

Grossklaus, D.

Bundesgesundheitsblatt 14 (15/16) 205-211 (1971) [12 ref. De]

This review-type article covers the following aspects of sources and types of residues in foods: drug residues in meat (antibiotics, chemotherapeutic agents, antiparasite compounds, sedatives, fattening agents, glucocorticosteroids); residues of additives used for animal nutrition; pesticide residues; residues arising from toxic compounds in the environment e.g. radiactive contamination, Pb, Hg, Cd, polychlorinated biphenyls; establishment of tolerance levels for residues; and meat examination from a legal point of view. JA

3 T 161

**Studies on the composition of curry powder.**

Mitra, S. N.; Gupta, P. S.; Sen, A. R.

Journal of the Institution of Chemists, India 43 (2) 81-82 (1971) [4 ref. En] [Central Food Lab., Calcutta, India]

Samples of curry powder were examined for moisture, volatile oil, non-volatile ether extract, NaCl, total ash, ash insoluble in dil. HCl, crude fibre, starch, Pb and added colouring matter by methods briefly mentioned. Results ranged from 4.5-8.5% moisture, 0.75-1.40% volatile oil, 14.6-30.0% non-volatile ether extract, 0.4-5.2% NaCl, 4.6-10.9% total ash, 0.08-1.50% ash insoluble in dil. HCl, 8.7-12.3% crude fibre, 25.5-34.1% starch (by acid hydrolysis) and 12.3-20.0% (by diastase), and 0-4.0 ppm Pb. Artificial colouring was absent in all cases. Total starch and NaCl should not exceed 15% in order for curry powder to conform to the standard for spice content (85%). Acid insoluble in dil. HCl, was also lower than the standard. PG

4 R 156

**Preliminary survey of heavy metal contamination of Canadian freshwater fish.**

Uthe, J. F.; Bligh, E. G.

***Journal of the Fisheries Research Board of Canada*** 28 (5) 786-788 (1971) [8 ref. En] [Fisheries Res. Board, Freshwater Inst., Winnipeg 19, Manitoba, Canada]

The concn. of Pb, Ni, As, Cu, Sb, Cd, Zn, U, Hg, Mn, Se, Cr and Sn in lake whitefish (i) and northern pike (ii) from Moose Lake, in (i) from Lake Ontario, in (ii) from Lake St. Pierre and Lake Erie, and in rainbow smelt and yellow perch from Lake Erie are given. With the exception of Hg, the levels were within regulatory limits and did not differ significantly between industrial and non-industrial areas. JN

4 R 206

**Radionuclides and selected trace elements in marine protein concentrates.**

Beasley, T. M.; Jokela, T. A.; Eagle, R. J.

***Health Physics*** **21** (6) 815-820 (1971) [27 ref. En] [Coll. of Fisheries, Univ., Seattle, Washington 98105, USA]

Concn. of $^{40}$K, $^{54}$Mn, $^{137}$Cs, $^{55}$Fe, $^{210}$Pb and $^{210}$Po and various trace elements were evaluated in fish protein concentrates from benthic and surface-feeding fish. $^{210}$Pb and $^{210}$Po were the most significant radionuclides present in both types of concentrate, although their actual concn. varied considerably among the fish species; evisceration of the fish prior to processing is recommended. Some concentrates contained sufficiently high levels of stable Pb, Co and Ag to substantially contribute to estimated current intakes of these elements. DMK

5 C 126

**Environmental research in toxic metals and pesticides.**

Lisk, D. J.

***New York's Food and Life Sciences*** **4** (4) 15-17 (1971) [15 ref. En] [Dept. of Entomology, Cornell Univ. Agric. Expt. Sta., Ithaca, New York, USA]

This review-type article discusses recent and current studies, initiated by the Pesticide Residue Laboratory (Ithaca, New York, USA), on the fate of toxic metals and pesticides in the environment. Studies and results outlined are: Hg, methylmercury, As and Pb in fish; Hg in Japanese quail; Cu and Ag compounds for control of algae; and DDT in fish. JA

5 C 128

**Mercury in food.**

Anon.

***British Food Journal*** **74** (846) 5 & 8 (1972) [En]

2 recent surveys of Hg contamination of food are discussed. Mean levels were 0.19 ppm in canned tuna fish, 0.08 ppm in canned salmon, 0.07 ppm in fresh and canned shellfish and crustaceans, 0.06 ppm in other canned fish and 0.06 ppm in fresh white fish. Levels in small samples of other foods were generally low, but showed a wide range. Tuna fish was seen to be the only product appreciably contaminated, ~80% of the Hg being in the form of methyl mercury compounds. Arsenical contamination of fish ranged from 0.5 to 20 ppm, the majority containing $<1.2$ ppm; cadmium contamination was in the range 0-6 ppm with levels generally $<1.2$ ppm; copper 0-50 ppm; zinc 0-50 ppm; and lead 0-5 ppm. Levels of heavy metals in tuna fish apart from Hg were low. PG

5 G 241

**Dietary intake of $^{210}$Pb.**

Morse, R. S.; Welford, G. A.

***Health Physics*** **21** (1) 53-55 (1971) [13 ref. En] [Health and Safety Lab., US Atomic Energy Commisssion, New York 10014, USA]

$^{210}$Pb, stable Pb and $^{226}$Ra were estimated in representative samples of foods from the diet in New York City. Milk contained 0.29 pCi $^{210}$Pb, 0.016 mg Pb and 0.25 pCi $^{226}$Ra/kg; total dietary intakes were 1.2 pCi $^{210}$Pb, 0.066 mg Pb and 1.6 pCi $^{226}$Ra/day. Values for other foods include the following: root vegetables, 0.21 pCi $^{210}$Pb/kg, 0.039 mg Pb/kg and 1.4 pCi $^{226}$Ra/kg; potatoes, 1.5, 0.089 and 2.8; canned fruit, 2.0, 0.17 and 0.17; bakery goods, 1.8, - and 2.8; whole grain products, 2.2, 0.05 and 2.2; eggs, 0.26, 0.045 and 6.1; meat, 0.49, 0.06 and 0.01; shellfish, 3.4, - and 0.80. JMD

5 J 679

**The determination of lead in biological materials by high-energy $\gamma$-photon activation.**

Hislop, J. S.; Williams, D. R.

***Analyst*** **97** (1150) 78 (1972) [4 ref. En] [Analytical Sci. Div., UKAEA Res. Group, Atomic Energy Res. Establishment, Harwell, Didcot, UK]

Samples of kale were irradiated for 2 h with bremsstrahlung from 5μA of 35-40 MeV electrons using the Harwell Linac. The $^{203}$Pb produced was separated and used to estimate Pb in kale. Results of 8 determinations were 2.7 ± 0.4 ppm, compared with 3.2 (1.6-5.4) ppm by other methods [H. J. M. Bowen, Adv. Activation Analysis (1969) **1**: 101]. JN

5 S 532

**[Additives, adjuvants, and residues in meat and meat products.]** Zusatzstoffe, Hilfsstoffe und Rückstände in Fleisch und Fleischwaren.

Mirna, A.

***Wiener Tierärztliche Monatsschrift*** **58** (11) 396-402 (1971) [35 ref. De, en] [Bundesanstal für Fleischforschung, Inst. für Chemie und Physik, Blaich 4, D-865 Kulmbach, W. Germany]

The topic is reviewed under the following headings: additives and adjuvants (foreign proteins, and nitrites, nitrates and smoking); pesticide residues (organochlorine compounds, possibilities for decontamination of foods, and review of the contamination situation); and contamination from industry (e.g. with Pb and Hg). JA

5 U 219
**[Wine: determination of lead content.]**
**Roumania,** Oficiul de Stat pentru
***Roumanian Standard*** **STAS 6182/5-70** 4pp.
(1970) [Ro] [Str. Edgar Quinet 6, Bucharest,
Roumania]

A detailed technique is specified for colorimetric determination of lead in wine by the dithizone method. Sensitivity of the method is 0.5 μg Pb. ELC

5 U 220
**[Vintage strong grape wines: quality requirements for certified products (Moldavian SSR).]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.770-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers vintage strong grape wines produced in wineries of the Moldavian SSR Ministry of Food Industry and awarded the state mark of quality, and deals in particular with 'Kheres krepkii' [strong sherry]. Standards on technological requirements, composition and organoleptic characteristics include: ethyl alcohol (vol. %), 20 ± 0.5; sugar (as invert sugar), 3 ± 0.5 g/100 ml; titratable acidity (as tartaric acid), 5 ± 2 g/l.; volatile acids (as acetic), ≤0.9 g/l.; sugar-free extract, ≥18 g/l.; $SO_2$, total ≤200 mg/l., free ≤20 mg/l.; Cu, ≤4 mg/l.; Sn, ≤20 mg/l.; Pb, no tolerance; Fe, ≤7 mg/l.; cyanide compounds, no tolerance. Regulations on analysis, bottling, packaging, labelling, transport, storage and supplier's guarantee (guaranteed storage life, 5 months) are listed. SKK

5 U 221
**[Vintage red table grape wine 'Oksamit Ukrainy': quality requirements for certified product.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.858-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers the vintage red table grape wine 'Oksamit Ukrainy' produced by complete fermentation from Cabernet grapes grown in the vinyards of the V.I. Lenin farm trust in Kherson region. Standards on technological requirements, composition and organoleptic characteristics include: ethyl alcohol (vol. %), 10-13; sugar (as invert sugar) ≤0.2 g/100 ml; titratable acidity (as tartaric acid), 4-7 g/l.; volatile acids (as acetic acid), ≤1.2 g/l.; $SO_2$, total ≤200 mg/l., free ≤20 mg/l.; sugar-free extract, ≥20 g/l.; Cu, ≤4 mg/l.; Sn, ≤20 mg/l.; Pb, no tolerance; cyanide compounds, no tolerance; methyl alcohol (vol. %), ≤0.05. Regulations on analysis, bottling, packaging, labelling, transport, storage and supplier's guarantee (guaranteed storage life, 5 months) are listed. SKK

5 U 222
**[Vintage white table grape wines: quality requirements for certified products (Moldavian SSR).]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.771-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers vintage white table grape wines produced in wineries of the Moldavian SSR Ministry of Food Industry and awarded the state mark of quality. It refers in particular to 'Aligote' wine from Aligote grapes. Standards on technological requirements, composition and organoleptic characteristics include: ethyl alcohol (vol. %), 10 ± 0.5 - 13 ± 0.5; sugar (as invert sugar), 0.2 ± 0.5 g/100 ml; titratable acidity (as tartaric acid), 6 ± 2 g/l.; volatile acids (as acetic acid), ≤1.0 g/l.; sugar-free extract, ≥16 g/l.; $SO_2$ total ≤200 mg/l., free ≤20 mg/l.; Cu, ≤4 mg/l.; Sn, ≤10 mg/l.; Pb, no tolerance; Fe, ≤7 mg/l.; cyanide compounds, no tolerance. Regulations on analysis, bottling, packaging, labelling, transport, storage and supplier's guarantee (guaranteed storage life, 6 months) are listed. SKK

5 U 223
**[Fruit-and-berry wines: quality requirements for certified products (Latvian SSR).]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.871-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers (i) 'Baltiiskoe' and (ii) 'Chernaya aroniya' fruit-and-berry wines produced by wineries and breweries of the Latvian SSR Ministry of Food Industry and awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include for (i) and (ii) respectively or for both (single figure): ethyl alcohol (vol. %), 15 ± 0.5 and 16 ± 0.5; sugar (as invert sugar), 18 ± 0.5 and 16 ± 0.5 g/100 ml; titratable acidity (as malic acid), 7.5 ± 1.0; volatile acids (as acetic acid), ≤1.3 g/l.; $SO_2$, total ≤200 mg/l., free ≤20 mg/l.; Cu, ≤4 mg/l.; Sn ≤10 mg/l.; Pb, no tolerance; Fe, ≤10 mg/l.; cyanide compounds, no tolerance. Regulations on analysis, bottling, packaging, transport, storage and producer's guarantee (guaranteed storage life, 4 months) are listed. SKK

5 U 224
**[Fruit wines.]**
**Poland**, Polski Komitet Normalizacyjny
***Polish Standard*** **PN-71/A-79121** 4pp. (1971) [Pl]

This standard replaces **PN-63/A-79121** and covers beverages obtained by fermentation of fruit and berries, containing ≥9 and ≤18% alcohol, and belonging to still, sparkling, carbonated and flavoured red or white fruit wine categories. Standards on composition and organoleptic characteristics include the following, common to all

categories: $SO_2$, total ≤200 mg/l., free ≤40 mg/l.; As, ≤0.2 mg/l.; Cu, ≤3.5 mg/l.; Pb, ≤0.4 mg/l.; Zn, ≤5 mg/l., Sn, ≤50 mg/l.; Fe, ≤25 mg/l.; storage life for wines packaged and stored according to regulations, 6 months. Regulations on packaging, storage, transport and examination are listed.    SKK

5 U 225
**[Ordinary flavoured grape wine 'Extra white strong vermouth': quality requirements for certified product.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.870-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers 'Extra white strong vermouth' awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include: ethyl alcohol (vol. %), 18 ± 0.5; sugar (as invert sugar), 10 ± 0.5 g/100 ml; titratable acidity (as tartaric acid), 4-6 g/l.; $SO_2$, total ≤200 mg/l., free ≤20 mg/l.; cu, ≤4 mg/l.; Sn ≤20 mg/l.; Fe, ≤7 mg/l.; Pb, no tolerance; cyanide compounds, no tolerance. Regulations on analysis, bottling, packaging, labelling, transport, storage and producer's guarantee (guaranteed storage life, 4 months) are listed.    SKK

5 U 226
**[Vintage brandies: requirements for certified products (Moldavian SSR).]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.135-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard replaces **GOST 5.135-69** and covers vintage brandies prepared from aged brandy spirit, water and sugar by wineries of the Moldavian SSR Ministry of Food Industry and awarded the state mark of quality. The standard covers (age of brandy spirit used in parentheses): (i) KV 'Moldova' brandy (6-7 yr); (ii) KVVK 'Doina' brandy (8-10 yr); (iii) highest quality KVVK 'Syurpriznyi' brandy (≥10 yr); and (iv) old KS 'Prazdnichnyi' brandy (~12 yr). Standards on technological requirements, composition and organoleptic characteristics include for (i) - (iv) respectively: ethyl alcohol (vol. %), 43 ± 0.3, 45 ± 0.3, 44 ± 0.3 and 44 ± 0.3; sugar (g/l. as invert sugar), 12 ± 2, 7 ± 2, 15 ± 2 and 9 ± 2; methyl alcohol (vol. %), ≤0.1 for all; Cu (mg/l.), ≤5.0 for all; Sn (mg/l.), ≤4.0 for all; Fe (mg/l.), ≤1.0 for all; Pb, no tolerance. Regulations on analysis, bottling, packaging, labelling, transport, storage and supplier's guarantee (guaranteed storage life unlimited) are listed.    SKK

5 U 230
**[Preserved vegetable, vegetable-and-fruit, meat, and vegetable-and-meat infant foods.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 16440-70** 9pp. (1970)
[Ru] [Moscow, USSR]

This standard covers preserved infant foods prepared from high-quality vegetables and fruit, meat, liver, milk and groats, supplemented with butter, smetana, egg yolk, tomato puree or juice, apple juice, sugar and salt, packaged in glass containers or lacquered cans, hermetically sealed with lacquered tin lids and sterilized. Regulations on appearance, taste and aroma and colour are given for the different categories of preserves, as well as standards for DM and salt contents and other characteristics of 61 items covered by the standard. Max. permitted contents of heavy metals are: Sn (in canned products), <150 mg/kg; Cu, <5 mg/kg; Pb, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and supplier's guarantee are listed.    SKK

5 U 241
**[Canned meat. Beef Stroganov: quality requirements for certified product.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.776-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers canned beef Stroganov awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include: meat content, 50-60% (remainder gravy); cooking salt, 1-1.8%; Sn, ≤100 mg/kg; Cu, ≤8 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and supplier's guarantee are listed.    SKK

5 U 242
**[Canned meat. Pork in jelly: quality requirements for certified product.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.769-71** 3pp. (1971)
[Ru] [Moscow, USSR]

This standard covers canned pork in jelly awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include: cooking salt, 1.5-2.0%; Sn, ≤100 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on analysis, packaging, labelling, transport and manufacturer's guarantee are listed.    SKK

5 U 245
**[Canned meat. Pork sausage meat: quality requirements for certified product.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.826-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers canned pork sausage meat awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include: moisture, ≤70%; starch, ≤5%; cooking salt, 1.6-1.8%; sodium nitrite, 25 mg/100 g; Sn, ≤100 mg/kg; Pb, no tolerance;

foreign admixtures, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and supplier's guarantee are listed.    SKK

5 U 247
**[Canned products. Squid au naturel: quality requirements for certified product.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.835-71** 3pp. (1971)
[Ru] [Moscow, USSR]

This standard covers cut-up headless squid with cuticle au naturel prepared from frozen filetted squid with cuticle. Standards on technological requirements, composition and organoleptic characteristics include: cooking salt, 1.2-2.0%; Sn, ≤200 mg/kg; Pb, no tolerance; foreign admixtures, residues of intestine, chitinous coat, beak and eyes, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and producer's guarantee are listed.    SKK

5 U 250
**[Preserves. Pickled fruit and berries.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 7694-71** 5pp. (1971) [Ru]
[Moscow, USSR]

This standard covers preserves from single or mixed kinds of fresh or frozen fruit and/or berries in pickle hermetically sealed in cans or glass jars and pasteurized or sterilized. Standards on technological requirements, composition and organoleptic characteristics of 13 spp. of fruit or berries include the following, common to all types of preserves: Sn (in canned products), ≤200 mg/kg; Pb, no tolerance; sugar content (as invert sugar), ≥12% for (i) slightly acid preserves and ≥17% for (ii) acid preserves; acetic acid content, 0.2-0.4% for (i) and 0.4-0.6% or 0.6-0.8% for (ii) depending on kind. Regulations on analysis, packaging, labelling, transport, storage and supplier's guarantee are listed.    SKK

5 U 251
**[Frozen prepared dishes. Home-made pepper and garlic sauce.]**
**Bulgaria**, Vurkhoven Suvet po Standartizatsiya
***Bulgarian Standard*** **BDS 8277-70** 4pp. (1970)
[Bg]

This standard applies to a frozen home-made sauce made from red peppers, tomato puree, onion, carrots, potatoes, black peppers, sunflower seed oil, parsley, garlic and salt. The sauce should contain 20-21% DM; 10 ± 1% fat; 1.3-1.8% cooking salt; ≤10 mg Cu, ≤20 mg K, ≤15 mg Fe, ≤0.3 mg Pb, ≤5 mg Zn, ≤0.2 mg As (all as salts, /kg product). The standard also covers packaging, labelling, sampling, testing, storage, transport and documentation.    HBr

5 U 293
**Specification for edible common salt.**
**India**, Standards Institution
***Indian Standard*** **IS:253-1970** 26pp. (1971) [En]
Price Rs 8.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, replaces IS:1845-1961 and IS:2035-1961. It prescribes the requirements and methods of sampling and test for edible common salt, free-flowing table salt and common salt for butter and cheese industry (dairy salt). Requirements for common salt, table salt and dairy salt respectively (% by wt.) are: water insoluble matter (max.) 1.0, 2.2, 0.03; chloride content as NaCl (min.) 96.0, 97.0, 99.6; acid insoluble matter (max.) -, 1.5, -; matter soluble in water, other than NaCl (max.) 3.0, -, -; Ca, water soluble (max.) -, 0.10, 0.01; Mg, water soluble (max.) -, 0.10, 0.01; sulphates, as $SO_4$ (max.) -, 0.50, 0.3; alkalinity, as $Na_2CO_3$ (max.) -, 0.20, 0.1; Pb (ppm) max. -, 2.0, 2.0; Fe (ppm) max. -, 50.0, 10.0; As (ppm) max. -, 1.0, 1.0; Cu (ppm) max. -, -, 2.0. Methods for determining the above characteristics are included in an appendix. A second appendix considers methods of sampling edible common salt. Packaging and marking are also considered.    VJG

5 U 298
**Specification for gelatin, food grade.**
**India**, Standards Institution
***Indian Standard*** **IS:5719-1970** 17pp. (1971) [En]
Price Rs 6.00. [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, prescribes the requirements and methods of test for edible gelatin. Requirements include: moisture (% by wt., max.) 15; total ash (% by wt., max.) 3.0; $SO_2$ (mg/kg, max.) 1000; N (on dry basis, % by wt., min.) 15; Zn (mg/kg, max.) 100; As (mg/kg, max.) 2; Pb (mg/kg, max.) 5; Cu (mg/kg, max.) 30; total bacterial count (per g, max.) 10 000; Escherichia coli (in 10 mg) absent; and product must pass the gel strength test. Other aspects covered are packaging, storage, marking, sampling and tests. 6 appendices are included describing methods for determining moisture, gel strength, total ash, $SO_2$, N and Zn.    VJG

5 U 308
**[Canned fish: fish in special sauce.]**
**Bulgaria**, V"rkhoven S"vet po Standartizatsiya
***Bulgarian Standard*** **BDS 4157-70** 4pp. (1970)
[Bg]

This standard replaces **BDS 4157-60** and covers canned carp, crucian carp, 'Besuga' (Cheilodactylis bergi), and cod in special (tomato) sauce. Standards on technological requirements, composition and organoleptic characteristics include: fish as % can contents, 75 ± 5; total fat, ≥6%; cooking salt, 1-2%; Sn, ≤200 mg/kg; Pb and As, no tolerance; foreign admixtures, no tolerance, pathogenic, facultatively pathogenic, non-sporulating and anerobic microorganisms, no tolerance, aerobic sporeformers, ≤10 spores/g. Regulations on

packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. Storage life at ≤15°C is set at 24 months. SKK

5 U 309

**[Grape concentrate for winemaking.]**

**Bulgaria**, V"rkhoven S"vet po Standartizatsiya
***Bulgarian Standard*** **BDS 7932-70** 3pp. (1970)
[Bg]

This standard covers grape concentrate produced by vacuum concn. from fresh or sulphited must and intended for winemaking. Standards on technological requirements, composition and organoleptic characteristics include: total sugar as invert sugar, 60-65%; titratable acidity as tartaric acid, ≤20% [? 20°]; free $SO_2$, ≤20 mg/kg; Cu, ≤15 mg/kg; Pb, Zn and As, no tolerance; foreign admixture, no tolerance; signs or microbial decomposition, no tolerance; moulds, no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. SKK

5 U 310

**[Canned fish: ocean fish in vegetable oil.]**

**Bulgaria**, V"rkhoven S"vet po Standartizatsiya
***Bulgarian Standard*** **BDS 7941-70** 5pp. (1970)
[Bg]

This standard covers canned horse mackerel, mackerel, whiting, pilchard spp., sardinella spp. tuna spp., cod, hake and space hake in vegetable oil alone or with condiments. Standards on technological requirements, composition and organoleptic characteristics include: proportion of fish to oil 80:20 (latitude ±5%); total fat, ≥18%; cooking salt, 1-2%; Sn ≤200 mg/kg; Pb and As, no tolerance; foreign admixtures, no tolerance; pathogenic, facultatively pathogenic, non-sporulating and anaerobic microorganisms, no tolerance; aerobic sporeformers, ≤10 spores/g. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. Storage life at ≤15°C is set at 24 months. SKK

5 U 311

**[Peach jam.]**

**Bulgaria**, V"rkhoven S"vet po Standartizatsiya
***Bulgarian Standard*** **BDS 8271-70** 3pp. (1970)
[Bg]

This standard covers jam from white-fleshed peaches containing added organic acid and pectin of low esterification level or 'Zhelefiks', packaged in glass jars or cans and sterilized. Standards on technological requirements, composition and organoleptic characteristics include: DM (refractometer at 20°C), ≥50%; total sugar as invert sugar, 45 ± 1%; acidity as tartaric acid, ≤1%; Cu, ≤8 mg/kg; Sn, ≤100 mg/kg; Pb, ≤0.4 mg/kg; Zn, ≤5 mg/kg; As, ≤0.2 mg/kg; Fe, ≤10 mg/kg; pathogenic microorganisms and signs of microbial decomposition, no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. Storage life is set at 1 yr. SKK

5 U 312

**[Frozen ready-to-eat dishes: 'veal with green beans'.]**

**Bulgaria**, V"rkhoven S"vet po Standartizatsiya
***Bulgarian Standard*** **BDS 8275-70** 3pp. (1970)
[Bg]

This standard covers frozen 'veal with green beans' packaged in waxed containers, Al foil (≤1 kg) or polyethylene (2.5 kg). Standards on technological requirements, composition and organoleptic characteristics include: meat, 25 ± 3%; green beans, 45 ± 3%; sauce, 30 ± 3%; fat, 4-8%, cooking salt, 1.5-2.0%; Cu, ≤10 mg/kg; Sn, ≤20 mg/kg; Pb, ≤0.3 mg/kg; Zn, ≤5 mg/kg; Fe, ≤15 mg/kg, As, ≤0.2 mg/kg; pathogenic and toxicogenic microorganisms and signs of microbial decomposition, no tolerance. Regulations pn packaging, labelling, sampling, analysis, storage, transport and official decomposition are listed. Storage life at -18°C is set at 12 months. SKK

5 U 313

**[Frozen ready-to-eat dishes: peppers stuffed with meat.]**

**Bulgaria**, V"rkhoven S"vet po Standartizatsiya
***Bulgarian Standard*** **BDS 8276-70** 4pp. (1970)
[Bg]

This standard covers frozen peppers stuffed with pig meat and beef or veal and packaged in waxed containers, Al foil (≤1 kg) or polyethylene (2.5 kg). Standards on technological requirements, composition and organoleptic characteristics include: peppers and stuffing, 48 ± 3%; sauce, 52 ± 3%; total fat, 4-8%; cooking salt, 1-1.5%; DM, ≥27%; Cu, ≤10 mg/kg; Sn, ≤20 mg/kg; Pb, ≤0.3 mg/kg; Zn, ≤5 mg/kg; Fe, ≤15 mg/kg; As, ≤0.2 mg/kg; pathogenic and toxicogenic microorganisms and signs of microbial decomposition, no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. SKK

5 U 333

**[Preserved products. Concentrated tomato products.]**

**Union of Soviet Socialist Republics**, Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 3343-71** 5pp. (1971) **[Ru]**
[Moscow, USSR]

This standard replaces **GOST 3343-46** and covers (i) tomato puree, (ii) tomato paste and (iii) salted tomato paste, all 3 of highest and 1st quality grades and packaged in glass containers or cans of ≤10 l. capacity, in Al tubes of ≤0.2 l. capacity or in metal or wooden casks of ≤100 l. capacity. Standards on technological requirements, composition and organoleptic characteristics include: DM by refractometer (%), (i) 12-20, (ii) 25-40, (iii) 27-37 (less salt); cooking salt in (iii), 8-10%; hard mineral admixtures, highest quality (i)-(iii) no tolerance, 1st quality (i) ≤0.05%, (ii) and (iii) ≤0.08%; Cu (i) <12-20 mg/kg according to DM content, (ii) and (iii) <40-60 mg/kg according to DM content; Sn in (i)-(iii) in cans, ≤200 mg/kg; Pb, no tolerance in

any; foreign admixtures, no tolerance in any. Regulations on analysis, packaging; labelling, transport, storage and supplier's guarantee are listed. Storage life for (ii) in Al tubes is set at 6 months at 0-5°C and ≤75% RH; storage life of (ii) or (iii) in casks is set at 1 yr both for (ii) at 0-20°C and ≤75% RH, and for (iii) at 0-12°C and 80% RH. SKK

5 U 339
**[Preserved fish. Fish soups.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 16676-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers soups prepared from different parts of a variety of fresh- and sea-water fish with or without addition of vegetables, groats, spices, broth and water, packaged in hermetically sealed glass containers (≤500 ml capacity) or cans (≤570 ml capacity) and sterilized at >100°C. Standards on technological requirements, composition and organoleptic characteristics include the following, common to all: common salt, 1.2-2.5%; acidity as malic acid, ≤0.5%; Sn, ≤200 mg/kg; Cu in soups containing tomato, ≤8 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and producer's guarantee are listed. SKK

5 U 340
**[Preserved fish in tomato sauce.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 16978-71** 5pp. (1971)
[Ru] [Moscow, USSR]

This standard, which will come into force on 1 July 1972, replaces **GOST 7451-55** and **GOST 10118-62**. It covers preserved fish in tomato sauce made from different parts of a variety of fish, packaged in hermetically sealed glass containers (≤350 ml capacity) or cans (≤353 ml capacity), and sterilized at >100°C. Standards on technological requirements, composition and organoleptic characteristics include: DM, contents, depending on kind of fish, 20-30%; acidity as malic acid, depending on kind of fish, 0.3-0.7%; Sn, ≤200 mg/kg; Cu, ≤8 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and producer's guarantee are listed. SKK

5 U 342
**[Canned meat. Minced bacon: quality requirements for certified product.]**
**Union of Soviet Socialist Republics,** Komitet Standartov, Mer i Izmeritel'nykh Priborov
***Soviet Standard* GOST 5.254-69** 3pp. (1969)
[Ru] [Moscow, USSR]

This standard covers canned minced bacon in 250 or 350 g cans, awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include: cooking salt, 1.2-1.8%; Sn, ≤100 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance; sodium nitrite, ≤3 mg/100g. Regulations on analysis, packaging, labelling, transport and storage are listed. SKK

5 U 344
**[Canned meat. Tongue in jelly: quality requirements for certified products.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.774-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers beef and pork tongues in jelly packaged in 250 g cans and awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include: tongue as % of can contents, ≥77%; cooking salt, 1.2-2.2%; sodium nitrite, ≤0.02%; Sn, ≤100 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and producer's guarantee are listed. Storage life at 4-15°C and 75% RH is set at 3 yr. SKK

5 U 345
**[Canned meat. Beef goulash: quality requirements for certified products.]**
**Union of Soviet Socialist Republics,**
Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.775-71** 3pp. (1971)
[Ru] [Moscow, USSR]

This standard covers canned beef goulash in 250 g cans awarded the state mark of quality. Standards on technological requirements, composition and organoleptic characteristics include: meat as % of can contents, ≥70%; cooking salt, 1.0-1.6%; Sn, ≤100 mg/kg; Cu, ≤8 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on analysis, packaging, labelling, transport, storage and producers's guarantee are listed. Storage life at 4-15°C and 75% RH is set at 3 yr. SKK

6 C 150
**[Studies on microelements in food products in areas of endemic nephropathy in Bulgaria.]**
Stephanov, J.; Yaneva, S.; Mladenova, S.
***Sbornik Trudove Nauchnoissledovatelskiya Khigienen Institut*** 12: 56-68 (1970, publ. 1971)
[93 ref. Bg, en] [Min. of Nat. Health, Res. Inst. of Hygiene, Sofia, Bulgaria]

Fresh wheat, maize, potatoes, beans, and milk were analysed for Cr, Cd, Ni and Sn by spectrographic methods, for Pb by the dithizone method, and for Se by colorimetry using 3,3-diamino-benzidine-HCL, in endemic nephropathy and control areas in Bulgaria. Concn. levels in mg/kg are extensively tabulated and related to the 2 communities. It is concluded that the increased concn. of these trace elements in body organs, reported by other authors, is not essentially synonymous with their intake through food. In particular, naturally occurring levels of Cd in corn,

potatoes, and beans are not considered to exert a toxicological effect per se, and a possible complex in vivo biochemical interaction is suggested. OA

6 H 847

**[Extraction-colorimetric method for determination of lead in wine.]**

Gandel'man, Kh. K.

***Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii*** **26** (7) 29-32 (1971) [Ru] [Kontrol'no-proizvodstvennaya Lab. Glavnuprvinproma, MPP Moldavian SSR, USSR]

A simple method for the determination of Pb in wine is described; it involves use of dithizone, and differs from earlier methods in that the necessity for special preparation of the sample is virtually obviated. Fairly large amounts of potassium citrate, hydroxylamine and ferrocyanide potassium are used for the determination; under these conditions the reaction with dithizone is specific for Pb in an alkaline environment. The determination is evaluated according to a calibration curve prepared for potassium citrate in concn. of 5, 7.5, 10, 12.5 and 15 mg/ml in 30 sec. The colouring is measured on the photocolorimeter by using a green filter at 530 nm. For analysis of wine of 9-13% alcohol content, 50 ml liquid is used; determination is at pH 8.8-9.0. Red wine requires preliminary centrifugation for 5 min at 1.5-3 thousand rev/min to clarify the sample. The method can also be used for determination of Pb in brandy. STI

6 H 877

**[Contamination of barley by lead.]** Die Kontamination von Gerste durch Blei.

Pöhlmann, R.

***Brauwissenschaft*** **25** (2) 44-45 (1972) [De, en, fr] [Versuchsanstalt für Bierbrauerei der LGA, Nuremberg, German Federal Republic]

Pb contents of 1 rye and 13 barley samples were dependent on the place of cultivation; when grown far away from traffic, the samples contained no Pb, whereas in the most unfavourable positions (close to traffic on the Autobahn) values of > µg/100 g were found. Reference is made to contents of Pb in other foods for comparison. TUB-IGB

6 J 927

**[Mineral composition of vegetables grown on plots additionally fertilized with sludge from industrial and household sewage.]**

Leshchenko, P. D.; Kononko, L. N.; Solomko, G. I.; Rudenko, A. K.

***Voprosy Pitaniya*** **31** (1) 81-85 (1972) [20 ref. Ru, en] [Kievskii Nauchno-issled., Inst. Gigieny Pitaniya Min. Zdravookhraneniya Ukrainskoi SSR, Kiev, USSR]

Potatoes, carrots and radishes were grown on control plots and on plots fertilized once with Kiev sewage sludge at 500 or 2000 metric tons/ha. Mean values with SEM are tabulated for a total of >740 determinations of Ca, Na, K, Fe, Zn, Cu, Mn, Ni, Mo, Pb and Sn in the 3 vegetables on the fertilized and control plots. SKK

6 J 929

**[Mineral composition of citrus and subtropical fruit.]**

Fishman, G. M.; Setkina, O. N.

***Trudy, Gruzinskii Nauchno-Issledovatel'skii Institut Pishchevoi Promyshlennosti*** 5: 88-91 (1971) [3 ref. Ru] [Gruzinskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

Values are tabulated for contents of ash and Al, Ba, Cu, Cr, Fe, Mn, Ni, Pb, Si, Sr, Sn, Ti, V, P, Mg, Na and Ca, determined spectrophotometrically in flesh and rind of the following varieties of citrus (flesh and rind data) and other fruit (whole): satsuma, orange (2 varieties), lemon (2 varieties), grapefruit (5 varieties), fig (6 varieties) and persimmon (6 varieties). SKK

6 U 366

**[Sweet alcoholic beverages and liqueurs.]**

**Bulgaria**, V'rkhoven S'vet po Standartizatsiya

***Bulgarian Standard*** **BDS 398-70** 6pp. (1970) [Bg]

This standard replaces **BDS 398-57, BDS 910-52**, and **BDS 3843-59** and covers sweetened beverages and liqueurs of high alcoholic content obtained by mixing in various proportions alcohol, syrup, water, fruit juices, fresh-blossom infusions, essences, eggs and harmless dyes. Standards on technological requirements, composition and organoleptic characteristics are given for 33 kinds of beverages and liqueurs. Standards common to all include: Fe, ≤5 mg/l.; Cu, ≤8 mg/l; Pb, As and Zn, no tolerance; preservatives, no tolerance. Regulations on packaging, labelling, storage, official documentation, sampling and analysis are listed. SKK

6 U 367

**['Pelin' wine.]**

**Bulgaria**, V'rkhoven S'vet po Standartizatsiya

***Bulgarian Standard*** **BDS 2888-70** 3pp. (1970) [Bg]

This standard replaces **BDS 2888-57** and covers carbonated and ordinary 'Pelin' (wormwood) wine prepared from table wine, wormwood infusion, sugar, grape juice and concentrate and fruit concentrates. Standards on technological requirements, composition and organoleptic characteristics include: alcohol, 8.5-10.5 vol.%; sugar as invert sugar, 45-50 g/l.; sugar-free extract, ≥15 g/l.; titratable acidity as tartaric acid, ≥[?≤] 3 g/l.; total $SO_2$, ≤300 mg/l. (≤200 mg/l. if preservatives are used); free $SO_2$, ≤40 (30) mg/l.; Fe, ≤10 mg/l.; Cu, ≤5 mg/l.; As, Pb and Zn, no tolerance; artificial dyes, no tolerance; preservatives, sorbic acid ≤200 mg/l., potassium sorbate ≤270 mg/l. Regulations on sampling, analysis, packaging, labelling, storage, transport and official documentation are listed. SKK

6 U 400

**[Fruit nectars.]**

**Bulgaria**, Vurkhoven Suvet po Standartizatsiya

***Bulgarian Standard*** **BDS 5162-70** 4pp. (1970) [Bg]

This standard replaces **BDS 5162-64** and covers single or mixed fruit nectars for direct consumption, produced by mixing fruit pulp with syrup in a 50:50 ratio preserved by physical means without use of ionizing radiations and packaged in glass bottles or lacquered cans. It contains regulations on quality requirements, packaging, labelling, storage, transport and official documentation. Standards include: extract (by refractometer at 20°C), 12-18% depending on type of fruit; total acidity as malic acid, 0.3-1.0%; ethyl alcohol, ≤0.3%; Cu, ≤5 mg/kg; Sn, ≤10 mg/kg (glass bottles) or ≤200 mg/kg (cans); Fe, ≤10 mg/kg; Zn, ≤5 mg/kg; Pb, ≤0.3 mg/kg; As, ≤0.2 mg/kg; artificial flavourings and dyes, no tolerance; non-sporeforming microorganisms and vegetative forms of sporeforming microorganisms, no tolerance. The following additions are permitted: citric acid ≤1%, ascorbic acid, juices of blackcurrant, bilberry, blackberry and other dark coloured fruit. **SKK**

7 M 709

**[Occurrence and importance of foreign substances in cereals.]** Vorkommen und Bedeutung von Fremdstoffen bei der Getreidenahrung. [A review]
Engst, R.
***Ernährungsforschung*** **16** (2) 275-285 (1971) [29 ref. De]

The occurrence in cereals of pesticides and fumigants (e.g. DDT, lindane, pyrethrum + piperonyl butoxide, methoxychlor, malathion, parathion, dichlorvos, $PH_3$, HCN, ethylene oxide, methyl bromide), plant growth regulators (e.g. chlorocholine chloride), nitrosamines, 3,4-benzopyrene, Pb, mycotoxins (particularly aflatoxin) is reviewed with reference to the source of such contaminants, residue levels in cereals, toxicity to humans, and tolerance levels in cereals. **AFa**

7 S 926

**[Sources of error and their elimination in the dithizone determination of lead in biological substances.]** Fehlermöglichkeiten und deren Eliminierung bei der Bestimmung von Blei mittles Dithizon in biologischen Substanzen.
Oelschläger, W.; Schwarz, E.
***Zeitschrift für Analytische Chemie*** **258** (3) 203-207 (1972) [15 ref. De, en] [Fachgruppe 9, Univ. Hohenheim, D-7000 Stuttgart 70, Emil Wolff-Strasse 8, German Federal Republic]

A method is given for determination of Bi, which causes the most serious interference in Pb determination. Investigations of Bi and Pb contents from inside and outside absorption areas gave the following results (ppm, DM): beef kidney liver and brain, from affected cattle, absorption zones Bi 0.04, 0.03, 0.08; Pb 40, 44, 3; non-absorption zones, Bi 0.02, 0.01, 0.03; Pb 1, 1, 0.4. Diethylammonium-N;N'-diethyldithiocarbamate gave the best and quickest separation. Sources of error introduced by reagents and ashing are discussed. A rapid method with good reproducibility is described. **RM**

7 U 506

**[Edible fungi products: sterilized fungi.]**
**Poland**, Polski Komitet Normalizacyjny
***Polish Standard*** **PN-71/A-78505** 5pp. (1971) [Pl]

This standard replaces **PN-65/A-78505** and covers whole or sliced fungi of single (unmixed) spp. intended for the home market and whole or sliced fungi of unmixed or mixed spp. intended for export, sterilized and packaged in jars or cans. Standards on classification, quality categories, description, permitted spp., and size, organoleptic and compositional requirements include the following common to all types and categories: presence of fungi of spp. other than declared, no tolerance; total acidity as lactic acid, ≤0.2%; cooking salt, 0.5-1.0%; foreign organic matter of animal origin, no tolerance; foreign organic matter of vegetable origin, ≤0.03%; wt. of strained fungi as % declared wt. of package contents, ≥55%; As, ≤0.2 mg/kg; Pb, ≤0.4 mg/kg; Cu, ≤10 mg/kg, Zn, ≤5 mg/kg; Sn, ≤50 mg/kg. Max. permitted mineral impurities range from 0.05% for chanterelles to 0.2% for Tricholoma. Regulations on packaging, storage, sampling and examination are listed. The min. guaranteed shelf life is set at 12 months. **SKK**

7 U 507

**[Edible fungi products: dried fungi.]**
**Poland**, Polski Komitet Normalizacyjny
***Polish Standard*** **PN-71/A-78510** 10pp. (1971) [Pl]

This standard replaces **PN-62/A-78500**, **PN-62/A-78501**, **PN-68/A-78506** and **PN-68/A-78507** and covers whole or sliced dried fungi of single (unmixed) spp. intended for the home market or for export. Standards on classification, quality categories, description and organoleptic and compositional requirements are listed for the following spp.: Boletus edulis, Gyroporus castaneus, Xerocomus subtomentosus, Leccinum scabrum, L. duriusculum, L. aurantiacum, Suillus luteus, S. bovinus, S. variegatus, Sarcodon (Hydnum) imbricatum, Marcoleplota procera, Tricholoma flavovireus, T. equestre, Cantharellus cibarius, Catathelasma (Clitocybe) imperiale, Armillariella mellea and (for export only) Gyromitra esculenta. The standards include the following common to all spp.: maggot reinfestation, mites, moulds, no tolerance; presence of fungi of other spp., no tolerance; moisture, ≤12%; As, ≤1 mg/kg; Pb, ≤2 mg/kg; Cu, ≤30 mg/kg; Zn, ≤20 mg/kg; Sn ≤200 mg/kg. Regulations on packaging, storage, transport, sampling and examination are listed. The min. guaranteed shelf life is set at 6 months. **SKK**

7 U 518

**[Margarine.]**
**Poland**, Polski Komitet Normalizacyjny
***Polish Standard*** **PN-71/A-86907** 5pp. (1971) [Pl]

This standard replaces **PN-65/A-86907** and covers the following types of margarine: ordinary margarine (emulsion of refined vegetable and animal fats (F) with water, an emulsifier, lecithin, dye, salt and sugar); pastry margarine (F with water

and, depending on pastry type, with normal or increased quantity of emulsifier and/or lecithin and with or without dye, sugar or salt); milk margarine (F with milk and water, an emulsifier, lecithin, 20 000 IU vitamin A and 2000 IU vitamin D/kg, dyes, salt and sugar); and dessert margarine ('Palma', F with milk and water, emulsifier, lecithin, dye and 30 000 IU vitamin A and 3000 IU vitamin D/kg;, 'Maja', as for 'Palma' but with guaranteed content of essential fatty acids and $C_{22}$ acids). Standards on technological requirements, composition and organoleptic characteristics include the following common to all types: peroxides in base, ≤2 (Lea number); Ni, ≤02 mg/kg; Pb, ≤2 mg/kg; As, ≤1 mg/kg; benzoic acid, ≤0.2%; sorbic acid, ≤0.1%; epihydrinic (glycidic) acid, no tolerance. Aroma substances may be added only if agreed by Ministry of Health. Regulations on packaging, storage, transport, sampling and analysis are listed. SKK

7 U 525

**[Stable confectionery products: biscuits, general requirements.]**

Poland. Polski Komitet Hormalizacyjny

***Polish Standard* PN-71/A-88051** 5pp. (1971) [Pl]

This standard covers hard-dough sweet, semi-sweet and non-sweet and soft-dough sweet biscuits without filling and biscuits with sugar + fat, chocolate, oilseed or other filling. Standards on technological requirements, composition and organoleptic characteristics include the following, common to all types of biscuit; ash, insoluble in 4 N HCl, ≤0.05%; As, ≤1 mg/kg; Pb, ≤2 mg/kg; Cu, ≤12 mg/kg; Zn, ≤ 20 mg/kg; Sn, ≤100 mg/kg. Regulations on packaging, storage, transport, sampling and analysis are listed. Min. guaranteed shelf life is set at: biscuits without filling with ≤10% fat, 4 months, with >10% fat, 3 months; biscuits with fatty fillings, 3 months, with butter filling, 1 month. SKK

7 U 537

**[Ethyl alcohol and alcoholic beverages: determination of Pb.]**

Roumania, Institutul Roman de Standardizare

***Roumanian Standard* STAS 184/21-70** 6pp. (1970) [Ro] [Bucharest, Roumania]

This standard partly replaces **STAS 184-54** and **STAS 4500-54** and covers both natural distilled and manufactured alcoholic beverages. Regulations on Pb determination with dithizone are listed. SKK

8 A 370

**[Method for wet-ashing biological materials.]** Verfahren zum Aufschluss und/oder zur Nassveraschung von organischem Material, insbesondere von biologischen Substanzen.

Sansoni, B.; Kracke, W. (Gesellschaft für Strahlenforschung mbH)

***West German Patent Application*** 1 773 750 (1971) [De]

Prior to analysis for inorganic components, e.g. traces of Fe, Pb, Hg, Cd, As, Zn, or for radionuclides e.g. $^{137}$Cs, $^{22}$Na or $^{106}$Ru, organic material, e.g. meat, fish, milk, flour, vegetables, bones or sugar, is ground and heated with $H_2O_2$ solution. A trace of ferrous salt is added, and after the spontaneous main reaction has taken place, the material is dried by evaporation. More $H_2O_2$ is added and evaporation repeated until a purely inorganic ash, contaminated only by the Fe added and ammonium salts, is left. For a more rapid method, $H_2O_2$ is added only once; in both cases unwanted fat is removed by extraction or separation with suitable organic solvents. W&Co

8 C 193

**Lead poisoning - a disease of our time.** [A review]

Hankin, L.

***Journal of Milk and Food Technology* 35** (2) 86-97 (1972) [128 ref. En] [Biochem. Dept., Connecticut Agric. Expt. Sta., New Haven, 06504, USA]

This review discusses the lead poisoning problem among children as regards sources of contamination as well as testing methods used to find potential victims of this man-made disease. The amounts and sources of lead found in foods, both raw and processed, and the quantities found in air are detailed. Implications of daily ingestion of small amounts of lead from food, water, and air are discussed. AS

8 C 197

**[Results of chemical tests relating to preservation of the environment.]** Ergebnisse chemischer Untersuchungen zum Umweltschutz.

Barchet, R.; Biermann, J.; Feucht, M.; Haag, Th.; Jori, H.; Wilk, G.

***Deutsche Lebensmittel-Rundschau* 68** (3) 69-74 (1972) [15 ref. De] [Chem. Untersuchungsamt, 7 Stuttgart 1, Stafflenbergstrasse 81, German Federal Republic]

Results of examinations of food in Stuttgart for residues of Sn, Hg, Pb, Cd, Be, and DDT are discussed, together with the most commonly used methods of analysis and existing information on toxic levels. Occurrence of Sn in foods reached the legal permitted max. level in the German Federal Republic of 250 mg/kg in very few samples; the majority contained <50 mg/kg. Recent work on the occurrence of Hg in fish, mainly in Japan and the USA, is reviewed. The occurrence of Pb on plant surfaces, especially near motorways, is mentioned, together with examination of a wide variety of fruits and vegetables exposed in a busy street in Stuttgart and from private gardens; this work indicated ubiquitous distribution of Pb. Blood Pb levels which result in illness are discussed, together with industrial sources, e.g. lead-processing factories, battery factories, car industry. Contents of Cd (used in anticorrosion processes) found in samples of urine were well below toxic levels. Be (used in various alloys) was also below toxic levels in urine samples, which in 1970 were all Be-free. Data are given for the incidence of DDT residues

in various parts of the German Federal Republic and compared with published figures for other countries. ELC

8 C 206

**[Problems posed by the use of hormones, antibiotics and other substances likely to leave residues in meat and milk products.]** [A lecture]

Prandl, O.

***Revue Technique des Veterinaires Hygienistes de l'Alimentation*** **10** (84) 25-28 (1972) [Fr] [Inst. Hygiene de la Viande, Ecole Superieure Vet., Vienna, Austria]

Measures that should be taken to ensure that hormones used for fattening beef cattle, pigs and poultry, and antibiotics added to feeds or used medicinally, are not present in meat and milk sold for human consumption are discussed. Residues which originate from pollution of water, air and soil (e.g. Pb, Hg, pesticides) or toxic substances which arise during the curing of meat (nitrosamines, polycyclic hydrocarbons) are also mentioned briefly. MEG

8 L 595

**[Determination of $SO_2$ and trace elements in sugar.]**

Diaconescu, L.; Costache, A.

***Industria Alimentara*** **22** (5) 268-269 (1971) [9 ref. Ro, en, fr, de, ru] [Inst. de Cercetari si Proiectari Alimentare, Bucharest, Roumania]

8 samples of refined Roumanian sugar contained $SO_2$ and trace elements within the following ranges (mg/kg): $SO_2$, 0.46-0.95 (5 samples examined); Pb, 0.2-0.7; Cu, 0.1-0.2 (absent in 2 samples); Fe, 0.4-0.66 (absent in 4 of 7 samples examined); and As, 0.025 (in 2 samples, absent in other 6). It is pointed out that these values are much lower than the max. set by FAO at the 4th Session of the Codex Committee in April 1967. SKK

8 P 1241

**[Lead content of milk in an area containing non-ferrous metal industries.]**

Ghelberg, N. W.; Rückert, I.; Straus, H.

***Igiena*** **21** (1) 17-22 (1972) [13 ref. Ro, fr, de, en, ru] [Inst. de Sanatate Publica si Cercetari Medicale, Cluj, Roumania]

Pb was determined colorimetrically with dithizone after nitric-perchloric acid digestion. An average (±SD) of 42.0 ± 27.6 μg/100 g human milk was found in 28 samples from an industrial town with a polluted atmosphere. In another, unpolluted town Pb was detectable in only 1 of 12 samples of human milk. The cows' milk supplies of the 2 towns were sampled and each contained similar amounts of Pb with an average of 4.5 μg/100 ml. JMD

9 A 387

**[Polarographic determination of Sn and Pb in canned foods.]**

Janitz, W.

***Medycyna Weterynaryjna*** **27** (1) 43-45 (1971) [11 ref. Pl] [Katedra Tech. Miesa, WSR, Poznan, Poland]

The method of Godar & Alexander [Ind. Engng Chem. analyt. Edn (1946) 18: 681] for simultaneous polarographic determination of Sn and Pb is recommended for canned foods. Traces of Fe, Cu, Co, Bi, Cd, Hg, Sb or Zn do not interfere. Sensitivity for Sn is 0.5 ppm. The method, with some slight alterations introduced by the author, is described in detail. SKK

9 H 1318

**[Methods of removing metals from must and wine.]**

Methoden zur Entfernung der Metalle in Most und Wein. [A lecture]

Würdig, G.

***Allgemeine Deutsche Weinfachzeitung*** **108** (11) 267-270 (1972) [De] [Weinforschungsinst., Landeslehr- & Versuchanstalt für Weinbau, Gartenbau und Landwirtschaft, Trier, German Federal Republic]

Max. permissible contents of trace elements in wine as established by the Office International du Vin and the latest W. German wine regulations are (mg/l.): Al 8, As 0.2, Pb 0.4, B (as basic acid) 80, Br (total) 1, F 5, Cd 0.1, Cu 5, Zn 6, Sn 1 and Ag 0.1. Tests have shown that even in areas of high contamination, these concn. are not reached. Methods of eliminating trace metals in the unlikely event of excess concn. in must and wine are described. TUB-IGB

9 U 644

**[Canned meat: mutton in natural juice, mutton hors d'oeuvres, mutton hash.]**

**Bulgaria**, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata

***Bulgarian Standard*** **BDS 337-70** 5pp. (1970) [Bg]

This standard replaces **BDS 337-50** and covers the products listed in the title, packaged in 200-400 g lacquered or unlacquered cans. It contains regulations on quality requirements, sampling and examination, packaging, labelling, official documentation, storage conditions, storage life and transport. Standards common to all 3 products include: blown or deformed cans, no tolerance; cooking salt, ≤2%; nitrities, ≤10 mg/100 g; Sn, ≤200 mg/kg; Pb and other heavy metals, no tolerance; pathogenic, facultatively pathogenic and toxicogenic microorganisms, no tolerance; storage life at ≤15°C, 2 yr. SKK

9 U 645

**Gravy powder.**

**Central Africa**, Standards Association

***Central African Standard*** **CAS No.S38: 1972** 11pp. (1972) [En] [PO Box 2259, Salisbury, Rhodesia]

This standard covers gravy powder in 100-500-g packages or 3-kg catering cans and lists scope, definitions, requirements regarding factories and employees, ingredients, chemical and physical criteria, containers, packaging, storage, labelling, marking, use of the Certification Mark, sampling and pathogenic organisms. It includes appendices on methods of chemical analysis and physical test methods. Standards include: As, ≤1 mg/kg; Cu, ≤10 mg/kg; Pb, ≤2 mg/kg; moisture, ≤6% ≥72 h after packaging; extraneous contamination, poisonous or deleterious substances, no tolerance. SKK

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10 A 432
**[The use of atomic absorption spectrophotometry for determination of microelements in foods.]**
Lipis, B. V.; Spektor, L. A.; Pchelintsev, A. M.
1568dh **10**: 72-78 (1970) [2 ref. Ru]
[Moldavskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

Methods for determination of Fe, Co, Ni, Cu, Pb, Zn and Cr by means of atomic absorption spectrophotometry were developed in the laboratories of the MNIIPP. The sensitivity of the methods was within the range 0.08-0.7 mg/l. The methods speed up the analysis and eliminate the necessity for preliminary preparation of samples (except for Cr). The analysis takes 1-2 min, except for Cr (2-3 h). STI

10 S 1381
**[The problem of residues from the environment in meat.]** Zum Problem umweltbedingter Rückstände in Fleisch.
Mirna, A.
***Fleischwirtschaft*** **52** (3) 321-324 & 327 (1972) [59 ref. De, en, fr] [Bundesanstalt für Fleischforschung, 8650 Kulmbach, Blaich 4, German Federal Republic]

The health hazards due to contamination of meat, meat products and fish with residues of stable or radioactive Pb, Hg, chlorinated pesticides and reaction products from $NO_3$ or $NO_2$ (especially nitrosamines) and N oxides (NO and $NO_2$) from gases produced during smoking of foods are discussed. RM

10 T 532
**[Official inspection of coal-tar dyes in 1969. III. Analysis of Cr, Zn, Fe and Pb contaminants in food coal-tar dyes and their aluminium lakes by atomic absorption spectrophotometry.]**
Tonogai, Y.; Nomura, Y.
***Bulletin of the National Institute of Hygienic Sciences [Eisei Shikenjo Hokoku]*** **88**: 139-143 (1970) [13 ref. Ja, en]

The application of atomic absorption spectrophotometry gave precise results in the quantitative determination of heavy metal contaminants in coal-tar food dyes and their Al lakes. Cr, Zn, Fe and Pb could be readily determined in the same sample after digestion with $H_2SO_4$ and $HNO_3$. The results were more accurate and reproducible than those obtained with the standard Japanese method. AS

10 U 656
**[Tomato concentrates.]**
Bulgaria, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 508-71** 6pp. (1971) [Bg]

This standard replaces **BDS 508-60** and covers pastes prepared from ripe red tomatoes preserved by sterilization or addition of salt and containing either (i) 28-30% (3 quality grades) or (ii) 38-40% (2 quality grades) DM (excluding salt). Standards on technological requirements, composition and organoleptic characteristics include: sugar equivalent (%), (i) 48-50 according to grade, (ii) 45-48, similarly; acid equivalent (%), (i) 8-9, (ii) 10; cooking salt, (i) not added, (ii) added at ≤3% or ≤10%; Cu, (i) ≤30, (ii) ≤40 mg/kg; Sn, ≤50 mg/kg for (i) and (ii) in glass jars and casks, ≤100 mg/kg for (i) and (ii) in cans; Zn, (i) ≤23, (ii) ≤25 mg/kg; Pb, (i) ≤2, (ii) ≤2.5 mg/kg; As, ≤1mg/kg for (i) and (ii); pathogenic and toxicogenic anaerobic sporeformers or vegetative forms of other such organisms, no tolerance; moulds, (i) 40-50/g according to grade, (ii) no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. (ii) with 3% added salt and not sealed hermetically should be stored at ≤2°C. Storage life for (i) and (ii) is set at ≤24 months in cans and ≤18 months in casks. SKK

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10 U 657
**[Sterilized whole skinned tomatoes.]**
Bulgaria, V"rkhoven S"vet po Standartizatsiya
***Bulgarian Standard*** **BDS 549-71** 4pp. (1971) [Bg]

This standard replaces **BDS 549-60** and covers whole skinned tomatoes in tomato juice packaged in glass jars or cans, hermetically sealed and sterilized. Regulations on classification (extra and 1st quality), quality requirements, packaging and labelling, sampling, analysis, storage, transport and official documentation are listed. Standards common to both quality grades include: tomato content as % net wt. of product, ≥65; cooking salt≤1.5%; DM in immersion juice (excluding salt), ≥5%; foreign admixtures, no tolerance; Cu, ≤10mg/kg product; Sn, ≤100 mg/kg for cans and ≤20 mg/kg for jars; Pb, ≤0.3 mg/kg; As, ≤0.2 mg/kg. Storage life is set at 1 yr. SKK

10 U 666
**Specification for wool green BS, food grade.**
India, Standards Institution
***Indian Standard*** **IS:6029-1971**: 11pp. (1971) [En]
[New Delhi 1, India]

Requirements and methods of test are prescribed. Min. dye content shall be 82% by wt. and subsidiary dyes shall not exceed 2% by wt. Requirements are specified (as max. % by wt.) for volatile matter at 135°C, chloride and sulphate, water-insoluble matter, combined ether extracts, 4,4'-DI (dimethylamino) benzhydrol (Michler's hydrol), 4,4'-DI (dimethylamino) benzophenone (Michler's ketone), and (as max. mg/kg) for As, Pb, Cu and Cr. Detailed methods of analysis are given in appendices. Packaging and labelling requirements are also included. ELC

11 C 260

**Mercury and heavy metals in food. II.**

Anon.

***British Food Journal*** 74 (847) 37-38 & 44 (1972) [En]

This is a review of a report of a working party addressed to the Food Additives and Contaminants Committee. Particular attention was given to methyl mercury compounds with reference to ingestion and accumulation of Hg in the tissues, and the effect on health. 4000 food samples (wheat flour, beef, beef liver, chicken, eggs, milk, dried milk, cheese, green vegetables, fish, shellfish, apples, tomatoes (both canned and fresh), rice, sugar, potatoes, fish liver oil, carrots, bacon, ham, pig kidney and liver) from 18 main towns in the UK were examined by atomic absorption spectrophotometry, colorimetry, and GLC for total Hg (organic and inorganic). All levels found were low (≤0.005 mg/kg), except in fish (0.03-0.20 mg/kg); in canned fish mean average values were 0.01-0.04 mg/kg. The results are compared with those given in a report by the Association of Public Analysts [FSTA (1972) **4** 5C128] and good correlation is found. The daily Hg intake through food in the UK is estimated at <10 µg/person; this partly reflects the low consumption of fish in the UK. Continued monitoring of Hg contamination, as well as contamination with Pb, Cd, and other heavy metals is recommended. **OA**

11 H 1772

**[Pb determination in grapes, must and wine.]** Bleibestimmung an Trauben, in Mosten und Weinen.

Mosandl, A.; Schmitt, A.

***Mitteilungen: Rebe, Wein, Obstbau und Früchteverwertung*** **22** (3) 165-168 (1972) [De, en, fr, es] [Bayerische Landesanstalt für Wein-, Obst- und Gartenbau, Würzburg, German Federal Republic]

$Pb^{2+}$ contents of grapes and young wines were determined by the use of Dithizon (diphenylthiocarbazon) which, with heavy metal ions ($Pb^{2+}$, $Cu^{2+}$, $Hg^{2+}$ and $Zn^{2+}$), forms coloured complexes that are soluble in chloroform or carbon tetrachloride; in a solution containing alkali tartrate and cyanide, the $Pb^{2+}$ reaction is specific. Analysis of 7 samples of grapes gathered from vines growing in very close proximity to busy motorways showed $Pb^{2+}$ contents of 0.425-0.650 mg/kg (well above the tolerance limit of 0.4 mg). 10 samples of young wines, also made from grapes from vines adjacent to motorways, contained <0.1 mg $Pb^{2+}$/l., well below the tolerance limit. Although musts contained 0.38 mg $Pb^{2+}$/l., the concn. dropped to <0.1 mg/l. in young wines made from them. HBr

12 A 540

**Collaborative study of a method for determining lead in plant and animal products.**

Hoover, W. L.

***Journal of the Association of Official Analytical Chemists*** **55** (4) 737-740 (1972) [3 ref. En] [Dept. of Agric. Analytical Services, Texas A&M Univ., College Station, 77843, USA]

A method for the determination of Pb in food products [FSTA (1969) **1** 11A276] was collaboratively studied. The method involves co-precipitation of Pb with strontium sulphate, conversion of carbonate, dissolution in nitric acid, and determination by atomic absorption spectrophotometry. 8 collaborating laboratories reported analytical results for 24 test samples. Results indicated that the systematic error was essentially the same as the random error at the 99% level. Acceptable coeff. of variation were observed. The method has been adopted as official first action. **AS**

12 C 310

**[Lead as a factor of atmospheric pollution and its accumulation in plants in fields bordering on motorways.]**

Zuber, R.; Bovay, E.; Tschannen, W.; Quinche, J.-P.

***Schweizerische Landwirtschaftliche Forschung*** **9** (1) 83-96 (1970) [15 ref. Fr, de, it, en] [Sta. Fed. de Recherches de Chimie Agric., Liebefeld-Berne, Switzerland]

12 J 1868

**[Determination of lead in vegetables and fruit, including wine grapes, by atomic absorption spectrophotometry.]** Bestimmung von Blei in Gemüse und Obst, einschliesslich Weintrauben, durch Atomabsorptionsspektrophotometrie.

Mack, D.; Berg, H.

***Deutsche Lebensmittel-Rundschau*** **58** (8) 262-263 (1972) [3 ref. De, en, fr] [Chem. Landesuntersuchungsanstalt, Stuttgart, German Federal Republic]

Pb content was estimated by 15 h wet ashing of the samples, formation of ammonium pyrrolidine dithiocarbamate complex, and measurement by atomic absorption spectrophotometry at 283.3 nm in methyl-isobutyl ketone phase. Pb content of wine grapes and ~100 samples of fruit and vegetables (unspecified) growing in the vicinity of various roads varied from 0.1-0.8 mg/kg and from 0.05-2 mg/kg respectively. **OA**

12 J 1940

**[Macro- and microelements in the wild berries in Siberia.]**

Rush, V. A.; Lizunova, V. V.

***Konservnaya i Ovoshchesushil'naya Promyshlennost'*** **1972** (1) 14-15 (1972) [Ru] [Novosibirskii Inst. Sovetskoi Kooperativnoi Torgovli, USSR]

The following macroelements: P, Mg, K, Na, Ca, Fe and microelements: Mn, Cu, Si, Al, Pb, Sr and Ba were determined in wild Siberian berries (blueberries, blackberries, raspberries, strawberries, red and blackcurrants, etc.). The macroelements were determined by commonly used methods. The microelements were determined by emission spectral analysis on spectrograph ISP-30. The methods used are briefly described. Of the macroelements P and K predominated in the

berries, while berries with high P content generally had a low K content. Highest P content was found in blackberries, highest Fe content in blackberries and strawberries. Most berries with the exception of blackberries and some others were low in Mg content. The following microelements were not determined by spectral analysis: V, Be, W, Ge, Li, As, Sb, Cr, Zr. Also the quantities of Cl, F, Hg, Ag and Au were not determined. Highest content of Mn was found in blueberries and blackberries. Highest content of Cu was in blackberries and raspberries. STI

12 R 700

**Determination of lead in fish by atomic absorption spectrophotometry and by polarography. I. Development of the methods.**

Gajan, R. J.; Larry, D.

***Journal of the Association of Official Analytical Chemists*** **55** (4) 727-732 (1972) [15 ref. En] [Div. of Chem. & Physics, FDA, Washington, DC 20204, USA]

A method for the determination of lead in fish by atomic absorption spectrophotometry and polarography is described. The samples were dry-ashed at 500°C and dissolved in 1N HCl; lead was determined by either method. Good agreement between atomic absorption spectrophotometry and polarography was obtained at levels of 1.0 to 10.0 ppm. Over this range the recoveries averaged 96.1% for polarography and 93.8% for atomic absorption spectrophotometry. Twelve species of fresh and salt water fish were analysed. AS

12 R 701

**Determination of lead in fish by atomic absorption spectrophotometry and by polarography. II. Collaborative study.**

Gajan, R. J.; Larry, D.

***Journal of the Association of Official Analytical Chemists*** **55** (4) 733-736 (1972) [En]

Nineteen laboratories, using 6 different models of atomic absorption spectrophotometers and 4 different types of polarographs, participated in this collaborative study. The average lead recoveries from 6 paired samples at 1-2, 5-6, and 10-11 ppm levels were 97.7% by polarography and 100.7% by atomic absorption. The average standard deviations were 0.32 and 0.41 ppm, respectively, and the average coefficients of variation were 7.9 and 13.1%, respectively. With collaborators reporting on both methods, the results of the overall method average were 4.3 ppm for polarography and 4.4 ppm for atomic absorption. Since there were no significant differences ($P>0.05$) found between the method averages, except at one of the unspiked levels, the 2 methods can be used to confirm each other at levels of 1-11 ppm. The polarographic method has been adopted as official first action for the determination of lead in fish. AS

12 S 1576

**[Studies on minerals in pork. I. Qualitative determination of minerals in pork by spectrographic analysis.]**

Tamate, R.; Ohtaka, F.

***Japanese Journal of Zootechnical Science [Nihon Chikusan Gakkai-ho]*** **43** (5) 251-256 (1972) [24 ref. Ja, en] [Fac. of Agric., Ibaraki Univ., Ami-machi, Ibaraki-ken, Japan]

Distribution of minerals in different muscles of swine and in various meats, was investigated, and the mineral elements present in various muscles were determined. Minerals were determined qualitatively by spectrography in: M. semimembranosus, M. longissimus dorsi, M. semispinalis capitis, M. masseter, M. gastrocnemius, heart, liver, pancreas and kidney from swine, and M. semimembranosus from cattle, horse, chicken and sheep. 17 minerals were detected in all, and 12 of these, Na, K, Mg, Ca, Al, P, Cu, Fe, Si, Zn, Pb and Mn were found in all of 18 pork samples used, while Ag, Cr, Mo, Ba and Sn were found in 16, 12, 10, 8 and 5 samples of those, respectively. B, Ni, Co, Cd, As, Be, Ce, Cs, Hg, Li, Sr and Zr could not be detected in pork samples used. 12 minerals detected in the pork samples were also found in beef, horse meat, chicken and mutton samples used. AS

12 T 681

**Measures trace metals in volatile flavourings.**

Eiserle, R. J.

***Food Engineering*** **44** (5) 86-87 (1972) [En] [Fritzsche-D&O, New York City, USA]

A non-flame atomic absorption instrument for the determination of heavy metals (especially Pb, As, Fe, Cu and Cd) in volatile flavouring agents is briefly described. The apparatus employs a carbon rod work head, heated electrically to dry, ash and atomize samples syringed into an orifice in the rod. Exact determination in the parts/million range may be made. WHCa

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INTERNATIONAL FOOD INFORMATION SERVICE

FAB 28

# CONTENT AND ANALYSIS OF LEAD IN FOODS

SELECTED FROM VOLUME 5
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

**under the direction of**

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

# INTRODUCTION

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journal patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

ASSISTANT EDITOR

1 C 8
**Working party on the monitoring of foodstuffs for heavy metals: survey of lead in food.** [Book]
**UK**, Ministry of Agriculture, Fisheries & Food
31pp. (1972) [38 ref. En] H. M. Stationery Office, London, UK Price £0.21

Lead in Total Diet samples and in individual fresh, canned and frozen foods was monitored by atomic absorption spectrophotometry. About 3000 analyses are reported for: Pb in Total Diet samples; Pb in individual food items of the national diet; Pb in fish landed in Great Britain; Pb in fish and shelfish from the Bristol Channel and Cardigan Bay; Pb in crops and vegetables grown near a metal refining plant. The Schedule to the Lead in Food Regulations 1961 is given in an appendix. Some conclusions are: Pb content of national diet is approx. 0.13 mg/kg (200 µg/person/day); Pb in canned baby-food is 0.24 mg/kg; Pb in baby food in jars was 0.04 mg/kg; Pb in shellfish was higher than in fish from the same area; more information is required on the uptake of Pb by crops grown near Pb refineries and smelters, or on land treated with sewage sludge. JN

1 H 116
**[Direct pulse-polarographic determination of As III and Pb in water and aqueous waste extracts.]**
Direkte puls-polarographische Bestimmung von As III und Pb in Wasser und wässrigen Abraumauszügen.
Heckner, H. N.
***Zeitschrift für Analytische Chemie*** **261** (1) 29-30 (1972) [3 ref. De] [Zentral Lab. für Chem. Analyse, Kernforschungsanlage, D-517 Jülich, Postfach 365, Federal Republic of Germany]

Rapid and sensitive determination of As and Pb in drinking water by direct pulse-polarography is described. Sensitivity of method is 20 ppb (parts/billion) As in most cases (100 ppb in difficult samples) and 5-10 ppb Pb. Analysis takes 10-15 min. RM

1 U 20
**[Quality standards for fruit juices in CMEA and some other countries.]**
Samsonova, A. N.; Brumshtein, V. D.
***Konservnaya i Ovoshchesushil'naya Promyshlennost'*** **27** (4) 32-35 (1972) [Ru]

Quality specifications for natural fruit juices (non-fermented), contents of DM, alcohol, ascorbic acid and/or preservatives and acidity (as malic acid), for various Communist states are covered. Lowest quality requirements were in Czechoslovakia, where in contrast to the Soviet Union, Bulgaria and others, the quality grades are not marked on the products. For example, for strawberry juice Soviet Standard **GOST 656-70** stipulates a DM content of ≥7.0-8.5%, according to quality grades, 0.8-2.0% acid, ≤0.3-0.5% alcohol and ≤0.06% $SO_2$. The Czechoslovak Standard **CSN 5682-10** stipulates ≥5.0% DM, ≤1.0% alcohol, but does not give the acid content. Bulgarian Standard **BDS 2250-63** requires ≥6.0-7.0% DM, 0.4-1.0% acid, and ≤0.3-0.5% alcohol. Standards recommended by the CMEA (Council for Mutual Economic Aid) commission for max. contents of metals (mg/kg juice) are: Cu, 5; Sn 25; Pb, 0.3; As, 0.2; Zn, 5. These are compared with the international (Geneva commission) standard. STI

1 U 22
**[Tomato juice.]**
**Roumania**, Institutul Roman de Standardizare
***Roumanian Standard*** **STAS 4098-70** 5pp. (1970) [Ro] [Bucharest, Roumania]

This standard covers juice obtained from tomatoes by crushing and straining and packaged in hermetically sealed containers without addition of colouring matter or preservatives. Technological requirements and organoleptic, physical, chemical and microbiological characteristics for (i) superior and (ii) ordinary quality juice include for (i) and (ii) respectively: soluble DM (excluding added acid and sugar), ≥5% for both; total acidity (as malic acid) related to soluble DM, ≤10 and ≤12 g/100 $cm^3$ [g/100 g?]; volatile acidity (as acetic acid) related to soluble DM, ≤0.6 and ≤0.8 g/100 $cm^3$ [g/100?]; NaCl, ≤1% for both; insoluble mineral impurities, related to soluble DM, ≤0.015 and 0.025%; ascorbic acid, ≥150 mg/kg and not stated; As, ≤2 mg/kg for both; Pb, ≤0.4 and ≤0.5 mg/kg; Cu, ≤2.5 and ≤5.0 mg/kg; Sn, ≤100 and ≤150 mg/kg; and pathogenic microorganisms, no tolerance. Regulations on methods of analysis, packaging, labelling, storage (at 4-12°C) and transport are listed. SKK

1 U 32
**[Canned fish: mussels in sauce.]**
**Bulgaria**, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 5304-71** 4pp. (1971) [Bl]

The ratio of mussel to sauce must be 70:30, with a ±5% tolerance. The product must contain 1-2% cooking salt, ≤100 mg K salts, ≤0.3 mg Pb salts, ≤0.2 mg As salts (/kg), ≤0.15% minerals, and ≤10 aerobic sporeformers/g; there is no tolerance for pathogenic, non-sporeforming or aerobic organisms. This standard replaces **BDS 5304-64**. HBr

1 U 38
**[Etur, a carbonated, non-alcoholic beverage.]**
**Bulgaria**, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 9375-72** 4pp. (1972) [Bl]

Etur, which contains essences of pear, rose, raspberry and strawberry, shall have 10 ± 0.3% sugar (as sucrose), an acid content (as tartaric acid) or 0.11-0.13%, ≥0.3% $CO_2$, ≤0.3 mgPb salts and ≤0.2 mg As salts (/1000 $cm^3$); there is no tolerance for mineral acids, pathogens, yeasts or moulds. HBr

1 U 39

**Specification for Fast Green FCF, Food Grade.**
**India**, Indian Standards Institution
***Indian Standard* IS: 6022-1971** 10pp. (1971) [En]
[New Delhi]

The standard prescribed requirements for dye content (min. 85% by wt.), max. % of wt. of volatile matter at 135°C, chloride and sulphate, water-insoluble matter, combined ether extract, subsidiary dyes (1.0) and dye intermediates (0.5), and max. content (mg/kg) of As (3), Pb (10), Cu (10) and Cr (20). Methods of determination are given for chloride (by potentiometric titration), sulphate (as $BaSO_4$), and dye intermediates (by salting out with $(NH_4)_2SO_4$, passage through a chromatographic tube (diagram given) and examination of the UV absorption spectra of 12 effluent fractions). ELC

1 U 40

**Specification for calcium propionate, Food Grade.**
**India**, Indian Standards Institution
***Indian Standard* IS: 6031-1971** 9pp. (1971) [En]
[New Delhi]

The specification includes requirements for purity as calcium propionate (% by wt.), max. % by wt. of moisture and water insoluble matter, and max. content (mg/kg) of As (3), Pb (10) and Fe (50). Methods of determination are prescribed for calcium propionate content (distillation with phosphoric acid and NaOH titration, or addition of NaOH and hydroxynaphthol blue and titration with disodium ethylenediaminetetraacetate); moisture (oven drying or preferably the Karl Fischer method); water-insoluble matter (filtration and drying); Fe (2,2-bipyridyl colour reagent). ELC

1 U 48

**[Preserved foods. Cabbage or peppers stuffed with meat and rice.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 17472-72** 4pp. (1972)
[Ru] [Moscow, USSR]

This standard covers preserves made from (i) sweet peppers or (ii) cabbage leaves stuffed with a mixture of meat, rice, fried onion, spices and greens, packaged in cans or glass jars, covered with tomato sauce, hermetically sealed and sterilized. Stipulated technological requirements, composition and organoleptic characteristics include: meat content in stuffing, (i) ≥47.5, (ii) ≥57.0%; fat content, (i) >6.0, (ii) >8%; NaCl, 1.0-1.5% for both; total acidity (as malic acid), ≤0.5% for both; Sn, <200 mg/kg for both in cans; Pb, no tolerance for both in cans; Cu, ≤10 mg/kg. Regulations on analysis, packaging, labelling, storage, transport and supplier's guarantee are listed. SKK

1 U 51

**[Brandy spirit (fresh).]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 17136-71** 3pp. (1971)
[Ru] [Moscow, USSR]

This standard covers spirit obtained by fractional distillation of young wine and intended for manufacture of brandies. Stipulated technological requirements, composition, and organoleptic characteristics include ethanol, 62-70 vol.%; higher alcohols (as isoamyl alcohol), 180-600 mg/100 ml absolute alcohol; esters (as ethyl acetate), 50-250 mg/100 ml absolute alcohol; aldehydes (as acetic aldehyde), 3-50 mg/100 ml absolute alcohol; volatile acids (as acetic acid), ≤80 mg/100 ml absolute alcohol; furfural, ≤3 mg/1oo ml absolute alcohol; methanol, ≤0.15 vol.%; total $SO_2$, ≤35 mg/l. in freshly distilled spirit and ≤15 mg/l. in 1-yr-old spirit; Cu, ≤8 mg/l.; Sn, ≤5 mg/l.; Fe, ≤1 mg/l.; Pb, no tolerance. Regulations on methods of analysis, packaging, labelling, transport, storage and manufacturer's guarantee are listed. SKK

1 U 54

**[Sweets. Quality requirements for attested product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.120-71** 11pp. (1971)
[Ru] [Moscow, USSR]

This standard replaces **GOST 5.120-69** and covers 31 named varieties of chocolate-coated sweets. Stipulated technological requirements, composition and organoleptic characteristics include the following common to all varieties: ash, insoluble in 10% HCl, ≤0.1%; Cu, ≤10 mg/kg; As, Pb and Zn, no tolerance. Regulations on methods of analysis, packaging, labelling, transport, storage and supplier's guarantee are listed. Guaranteed storage life is set at 15 days-4 months, depending on type. SKK

1 U 55

**Specification for glucose syrup (liquid glucose).**
**Malaysia**, Standards Institution of Malaysia
***Malaysian Standard* MS 3.7:1971** 14pp. (1971)
[En] [Kuala Lumpur]

Glucose syrup shall be clear, transparent, free from foreign odour, taste or matter and conform to the following requirements: TS, min. % 75; dextrose equivalent, min. % dry basis 25; sulphated ash, max % dry basis 0.5; $SO_2$, max. ppm 40, or for sugar confectionery manufacture only 450; As, max. ppm 1.0; Pb, max. ppm 2.0; Cu, max. ppm 2.0. Specifications are given for packaging and marking and selection and preparation of samples for analysis. Detailed techniques are prescribed in appendices for determination of TS (by vacuum oven drying) and dextrose equivalent (by Lane and Eyon cuprimetric procedure). ELC

1 U 87

**[Preserved foods. Canned 'gogoshary' in tomato sauce: quality requirements for attested product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.1205-72** 3pp. (1972)
[Ru] [Moscow, USSR]

This standard covers canned 'gogoshary' consisting of a mixture of sliced sweet peppers and fried onions in tomato sauce, packaged in 0.6-l. lacquered cans and awarded the State mark of quality. Stipulated technological, organoleptic, physical, chemical and bacteriological requirements include: fat, ⩾8%; cooking salt, 0.9-1.2%; total acidity as malic acid, ⩽0.6%; ascorbic acid, ⩾50 mg/100 g; Sn, ⩽100 mg/kg; Cu, ⩽10 mg/kg; Pb, no tolerance. Regulations on methods of analysis, packaging, labelling, transport and storage (at 0°-20°C and ⩽75% RH) are listed. SKK

1 U 91

**[Preserved foods. Canned aubergine paste: quality requirements for attested product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.1207-72** 3pp. (1972)
[Ru] [Moscow, USSR]

This standard covers canned aubergine paste in 0.6-l. lacquered cans and awarded the State mark of quality. Stipulated technological, organoleptic,physical, chemical and bacteriological requirements include: DM, ⩾24%; fat, ⩾10%; total acidity as malic acid, ⩾0.5; cooking salt, 1.2-1.6%; Sn, ⩾100 mg/kg; Cu, ⩽10 mg/kg; Pb, no tolerance. Regulations on methods of analysis, packaging, labelling, transport and storage (at 0-20°C and ⩽75% RH) are listed. SKK

1 U 93

**[Preseved foods. Tomato paste: quality requirements for attested product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.1220-72** 4pp. (1972)
[Ru] [Moscow, USSR]

This standard covers tomato paste from strained cooked tomato pulp packaged in hermetically sealed lacquered cans of ⩽0.35-l. capacity, and awarded the State mark of quality. Stipulated technological, organoleptic, physical, chemical and bacteriological requirements include: DM (refractometer), 30 ± 2%; total acidity as malic acid in DM, ⩽10%; total sugar as invert sugar in DM, ⩾49%; mineral admixtures, no tolerance; Cu, ⩽15 mg/kg; Sn, ⩽150 mg/kg; Pb, no tolerance; moulds, ⩽40% of microscope fields. Regulations on methods of analysis, packaging, labelling, transport and storage (at 0-20°C and ⩽75% RH) are listed. SKK

1 U 95

**[Preserved meats. Meat in white sauce: quality requirements for attested product.]**
**USSR**. Komitet Standartov, Mer i Izmeritel'nykh Priborov
***Soviet Standard* GOST 5.104-68** 4pp. (1971)
[Ru] [Moscow, USSR]

This 1971 revision of the 1968 standard covers canned meat in white sauce, awarded the State mark of quality and of net wt. ⩽550 g. Stipulated technological and quality requirements include: meat as % net wt., ⩾55; sauce as % net wt., ⩽45; cooking salt, ⩽1.8%; Sn, ⩽100 mg/kg product; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on methods of analysis, packaging, labelling, transport and storage are listed. SKK

1 U 96

**[Preserved fish. Canned natural Kuril'sk mackerel: quality requirements for attested product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.1392-72** 4pp. (1972)
[Ru] [Moscow, USSR]

This standard covers natural Kuril'sk mackerel packaged in lacquered cans of ⩽350-ml capacity, hermetically sealed, sterilized at ⩾100°C and awarded the State mark of quality. Stipulated technological, chemical and organoleptic requirements include: cooking salt, 1.2-2.0%; Sn, ⩽200 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on sampling, methods of analysis, packaging, labelling, transport and storage (at ⩾2°C and ⩽75% RH) are listed. SKK

1 U 100

**[Preserved meats. Stewed mutton: quality requirements for attested product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 5.1125-71** 3pp. (1971)
[Ru] [Moscow, USSR]

This standard covers canned stewed mutton awarded the State mark of quality. Stipulated technological, organoleptic, physical, chemical and bacteriological requirements include: meat and fat, ⩾56.5% net wt., including ⩾8% rendered mutton fat; cooking salt, ⩽1.5% net wt.; Sn, ⩽100 mg/kg; Pb, no tolerance; foreign admixtures, no tolerance. Regulations on sampling, methods of analysis, packaging, labelling and transport are listed. SKK

1 U 101
**[Preserved foods. Kherson sauce: quality requirements for attested product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.1063-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers Kherson sauce in glass jars awarded the State mark of quality. Stipulated technological, organoleptic, physical and chemical requirements include: DM (refractometer), ⩾30%; total acidity as malic acid, 1-1.5%; cooking salt, 2-2.5%; Cu, ⩽20 mg/kg; Sn, ⩽150 mg/kg; Pb, no tolerance; sand, ⩽0.02%. Regulations on methods of analysis, packaging, labelling, transport, storage (at 0-20°C and ⩽75% RH) and supplier's guarantee are listed. SKK

1 U 102
**[Branded red table grape wines: quality requirements for attested products.]**
**USSR**, Komitet Standartov, Mer i Izmeritel'nykh Priborov
***Soviet Standard*** **GOST 5.136-69** 5pp. (1971)
[Ru] [Moscow, USSR]

This 1971 revision of the 1969 standard covers (i) 'Negru de Purkar', (ii) 'Kaberne' and (iii) 'Roshu de Purkar' red Moldavian table wines awarded the State mark of quality. Stipulated technological, organoleptic, physical and chemical requirements include for (i)-(iii) respectively: ethyl alcohol, 10.5-13, 11-14 and 10-13 vol.%; sugar as invert sugar, ⩽0.3 g/100 ml for all 3; titratable acidity as tartaric acid, 6 ± 2 g/l. for all 3; volatile acids as acetic acid, ⩽1.2 g/l. for all 3; extract, ⩾20, ⩾24 and ⩾20 g/l.; total $SO_2$, ⩽200 mg/l. for all 3; free $SO_2$, ⩽20 mg/l. for all 3; Cu, ⩽4 mg/l. for all 3; Sn, ⩽10 mg/l. for all 3; Pb, no tolerance in any; Fe, ⩽10 mg/l. for all 3. Regulations on methods of analysis, bottling, packaging, labelling, transport and storage are listed. The guaranteed storage life is set at 6 months. SKK

1 U 106
**[Branded dessert grape wines: quality requirements for attested products.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 5.1119-71** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers 'Gulya-Kandoz' and 'Aleatiko' branded dessert wines produced by Uzbek SSR wineries and awarded the State mark of quality. Stipulated technological, organoleptic and chemical requirements include: ethyl alcohol, 16 ± 0.5 vol.%; sugar as invert sugar, 22 ± 0.5 g/100 ml; titratable acidity as tartaric acid, 5 ± 2 g/l.; volatile acids as acetic acid, ⩽1 g/l.; sugar-free extract, ⩾18 g/l.; total $SO_2$, ⩽200 mg/l.; free $SO_2$, ⩽20 mg/l.; Cu, ⩽4 mg/l.; Sn, ⩽20 mg/l.; Fe, ⩽7 mg/l.; Pb, no tolerance; cyanides, no tolerance. Regulations on methods of analysis, bottling, packaging, labelling, transport, storage and manufacturer's guarantee are listed. The guaranteed storage life is set at 5 months. SKK

1 U 107
**[Canned Pacific salmon: technological requirements for export product.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 10.63-72** 4pp. (1971)
[Ru] [Moscow, USSR]

This standard covers canned Pacific salmon of the humpback, coho, keta and sockeye varieties. Stipulated technological, chemical, physical, organoleptic and bacteriological requirements include: cooking salt, 1.2-2%; Sn, ⩽200 mg/kg contents; Pb, no tolerance; can vacuum, ⩾170 mm Hg; foreign admixtures, no tolerance. Regulations on methods of analysis, packaging, labelling, transport and storage are listed. SKK

1 U 119
**[Fruit and berry povidlo (paste).]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 6929-71** 5pp. (1971) [Ru]
[Moscow, USSR]

This standard replaces **GOST 6929-54** and covers fruit or berry purees or their mixtures, boiled with sugar with our without addition of pectin and permitted food acids, and packaged in glass jars, cans, wooden boxes or casks, or Al or plastics containers. Specified varieties are: apricot, quince, cherry plum, cherry, pear (cultivated), dewberry, wild apricot, gooseberry, cornelian cherry, cranberry, peach, plum, blackcurrant, apple (wild and cultivated), and mixed. Stipulated technological, organoleptic, physical, chemical and microbiological requirements include: DM % (refractometer), ⩾66; total sugar as invert sugar, ⩾60%; total acidity as malic acid, 0.2-1%; total $SO_2$, ⩽0.01%, sodium benzoate as benzoic acid, ⩽0.07%; sorbic acid, ⩽0.05%; sand, ⩽0.05%; Cu, ⩽10 mg/kg; Sn (canned products), ⩽200 mg/kg; Pb (canned products), no tolerance; foreign admixtures, no tolerance. Regulations on methods of analysis, packaging, labelling, transport, storage and supplier's guarantee are listed. SKK

1 U 120
**[Fruit jams.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard*** **GOST 7009-71** 5pp. (1971) [Ru]
[Moscow, USSR]

This standard replaces **GOST 7009-54** and covers jams from fruit, berries or melons boiled with sugar to a jelly-like consistency with or without addition of jelly-forming juices or pectin, sterilized (A) or not sterilized (B), and packaged in glass jars, cans, wooden casks or plastics containers. Specified varieties are: apricot, quince, cherry plum, orange, cowberry, cherry, blueberry, pear, melon, dewberry, wild apricot, strawberry, fig, cornelian cherry, cranberry, redcurrant, gooseberry, raspberry, tangerine, peach, rowanberry (2 varieties), plum, pineapple guava (Feijoa Sellowiana), physalis, blackcurrant, bilberry and apple. Stipulated technological, organoleptic, chemical and microbiological requirements include:

DM (refractometer), A, ≥68, B≥0%; sugar as invert sugar, A≥62, B≥65%; sorbic acid (plastics Sn (canned products), ≤200 mg/kg; Pb (canned products), no tolerance; foreign admixtures, no tolerance. Regulations on methods of analysis, packaging, labelling, transport, storage and supplier's guarantee are listed. SKK

1 U 121
**[Confectionery products.]**
**Colombia**, Instituto Colombiano de Normas Tecnicas
***Colombian Standard*** **ICONTEC** 424 (1968) [Es]
[Apartado Aereo 14237, Bogota 2, Colombia]

This standard covers general requirements of confectionery products, including classification (hard, soft, coated), general manufacturing conditions, bacteriological requirements, test methods, packaging and presentation. Products must contain ≤10 ppm Cu, ≤2 ppm Pb and ≤0.1 ppm As. HBr

2 A 75
**A simplified separation of strontium, radium, and lead from environmental media [including food] by precipitation followed by fractional elution.** [Letter]
Gregory, L. P.
***Analytical Chemistry*** **44** (12) 2113-2115 (1972)
[9 ref. En] [Nat. Radiation Lab. Dept. of Health, PO Box 25-099, Victoria Street, Christchurch, New Zealand]

2 A 109
**[Natural heavy metal (copper, lead and zinc) content in the vegetables and fruit grown in the Sofia area.]**
Khadzhimitev, P.
***Khranitelna Promishlenost*** **20** (8) 18-20 (1971)
[31 ref. Bg, ru, en, fr, de]

The colorimetric dithizone method was used to determine the Cu, Pb and Zn content in the following fruit and vegetables: wheat, maize, white beans, green beans, potatoes, tomatoes, pepper shots, cabbage, carrots, marrows, spinach, locica, onions, apples and peaches. The results are tabulated. The highest average Cu content was found in white beans (9.92 mg/kg). The Pb content never surpassed 0.5 mg/kg. The highest Pb content appeared in white beans (20.2 mg/kg) and in wheat and maize. The data on Cu do not differ significantly from those given in the Soviet literature [Gabovich & Kul'skaya Voprosy Pitaniya (1964) No. 1, 60; Val'chuk, Voprosy Pitaniya (1967) No. 6, 83-84] except for wheat. The results for lead are similar to those of Bergner & Haller. [GDCh Fachgruppe Lebensmittelchemie & gerichtliche Chemie (1968) **22** (11) 298-308] and Cheftel [Lebensmitt. Untersuch. (1951) **93**: 235]. There is no difference between the Zn contents found by the author and the data given in literature (except white beans and onions). Results of analyses carried out with five kinds of vegetables and fruit grown in the Burgas region did not show considerable differences. STI

2 A 124
**[Determination of lead in vegetable matter by atomic absorption spectrophotometry.]** Die Bestimmung des Bleis in pflanzlichem Material mit Hilfe des Atomabsorptionsspektrophotometers.
Zuber, R.
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** **63** (2) 229-239 (1972) [11 ref. De, fr, it, en]
[Eidgenössische Forschungsanstalt für Agrikulturchemie Liebefeld-Berne, Switzerland]

Pb contents were determined in various Swiss vegetables and also in imported vegetables, using a Beckman 444 atomic absorption spectrophotometer. The following values (ppm in DM) were found for vegetables grown respectively at distances of 10 and 60 m from the Berne-Zurich motorway and in a locality near Berne without motor traffic: cauliflower, 8, 4 and 3; green beans, 10, 5 and 3; cabbage leaves, 20, 16 and 3; kohlrabi, 6.5, 6.0 and 3.5; lettuce, 12, 8 and 9; and onion, 8, 4 and 4; 20-50% of the Pb could be removed by washing the vegetables. Values are quoted for 25 vegetables grown in Switzerland or imported from Italy, France or The Netherlands; contents were mostly higher in Swiss vegetables, except for aubergines, endives and parsley. Finally, very high values, ranging from approx. 500 to approx. 1000 ppm in DM are quoted for spinach grown in the vicinity of a metal works. SKK

2 A 127
**Advanced analytical instrumentation.**
Leslie, R. C.
***Food Manufacture*** **47** (11) 41, 43, 46 (1972)
[En] [Perkin-Elmer Ltd., Beaconsfield, Bucks, UK]

The various analytical instruments and techniques described are classified into 2 categories; (i) those which separate mixtures and (ii) those which identify single components or measure some physical property which can be related to chemical or physical structure. Included in (i) are: the use of gas-liquid and liquid-solid chromatography for the analysis of complex mixtures, e.g. essential oils and meat flavours; TLC for the separation and identification of pesticide residues in cereals, vegetables and fruit; analysis of halogen-containing residues using the electron capture detector; and liquid chromatography for the separation of lipids, antioxidants, oligosaccharides, food colours and for the resolution of aflatoxins $B_1$ and $G_1$. In (ii) details are given of: spectrophotometry; UV and visible absorption spectroscopy and their use for the quantitative determination of artificial colourings and assay of antioxidants, preservatives, additives, and pesticides present in foodstuffs; atomic absorption and its use in the determination of toxic elements such as As, Pb, Cd, Co, Zn, Sn and Hg in foodstuffs; the application of IR analysis to the identification of organic substances e.g. characterization of essential oils, determination of BHT in fats and the identification of preservatives extracted from meat; emission spectroscopy for quantitative analysis and simultaneous determination of several elements e.g. Na, K; fluorescence emission measurements for the determination of thiamine, riboflavine, other vitamins, lecithin, aromatic amines and carbohydrates; and elemental and thermal analysis. AA

2 C 50

**[Studies on extractable heavy metals in canned foods. I. Detection of tin and lead from various sorts of canned baby foods after their opening.]**
Kimura, Y.; Ueda, K.; Nishizima, M.; Maki, T.; Wada, M.; Takahashi, S.; Yamada, T.; Arai, M.; Uematsu, T.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health* 22**, 95-100 (1970) [9 ref. Ja, en] [Dept. of Food Hygiene, Tokyo Metropolitan Res. Lab. of Public Health, Japan]

90 cans of baby food were tested, using polarographic and atomic spectrophotometric techniques, to determine the quantity of heavy metals which dissolved in the contents of the can after opening. It was found that a large amount of Sn dissolved within a short time of opening and that Pb content of the baby foods increased during storage at room temp.; keeping cans in a refrigerator resulted in decreased quantities of Pb and Sn in the food. It is suggested that baby food should not be stored in the can after opening but transferred to some other form of container e.g. glass. [From En summ.] AA

2 C 55

**[Public health aspects of ceramic, glazed and enamelled objects.]** Bedarfsgegenstände aus keramischen Massen, Glasuren und Emaille in lebensmittelchemischer Sicht.
Ruff, H.
***Zeitschrift für Lebensmitteluntersuchung und -Forschung* 149** (5) 284-289 (1972) [1 ref. De, en] [Staatliche Chem. Untersuchungsanstalt, Erlangen, Federal Republic of Germany]

The German lead and zinc regulations of 1887 are critically considered in the light of modern conditions and it is pointed out that zero tolerance required in them is untenable in view of the development of analytical methods. Proposals of the German Federal Health Office on public health evaluation of the objects named in the title are discussed from the viewpoint of future Common Market regulations. SKK

2 L 127

**Determination of trace amounts of metals in foodstuffs by atomic absorption spectroscopy.**
Nelson, G.; Smith, D. L.
***Proceedings of the Society for Analytical Chemistry* 9** (8) 168 (1972) [1 ref. En] [Rowntree Mackintosh Ltd., Halifax, Yorks, UK]

An automated dry ashing technique was used for destruction of confectionery raw materials and finished products prior to determination of their Pb, Cu, Sn and Zn contents. Ashing in a temp. programmable electric muffle furnace, housing 40 crucibles (3 in diam.) to a max. temp. of 550°C, required min. supervision by an analyst and ashed 200 samples/working week. Ashes were extracted with boiling 50% HCl and analysed by atomic absorption spectrophotometry using an EEL 240 instrument in conjunction with an automatic sampler. Wet ashing using a mixture of $H_2SO_4$ and $HNO_3$ was used for destruction of confectionery material prior to determination of Cd and Hg contents by atomic absorption (Cd by conventional flame, Hg by cold vapour technique). Vegetable C could be distinguished from Channel Black by its Sn content of 0.2-0.4% against none in Channel Black. Presence of metallic Fe >30 ppm in chocolate could lead to erroneous fat contents as measured by NMR spectroscopy. RM

2 S 263

**[Use of dried yeast preparation in the production of canned meat for travellers.]**
Zuchowicz. S.
***Gospodarka Miesna* 24** (9) 17-18 (1972) [Pl]

Dried molasses yeast for food purposes, supplied by a yeast factory in Poland and stated to contain ≥90% DM, ≤10% ash and ≥48% crude protein and to have a total bacterial count of ≤50 000/g, no coliforms in 0.1 ml, be free from anaerobic sporeformers and contain ≤5 mg Pb, As or Cu/kg and ≤10 mg Fe/kg, was tested in the preparation of canned meat for travellers (340 g or 395 g packs). The yeast was included at 2% and found to be fully suitable as substitute for sodium caseinate or soya protein, normally used in the recipe. It is pointed out that yeast costs 14.2 zlotys/kg vs. 60 zlotys/kg for sodium caseinate. SKK

2 U 135

**[Preserved foods. Natural tomato juice.]**
**USSR**, Gosudarstvennyi Komitet Standartov
***Soviet Standard* GOST 937-72** 3pp. (1972) [Ru] [Moscow, USSR]

This standard covers natural juice from fresh ripe tomatoes with or without salt, packaged in glass jars or lacquered cans (≤3-l. capacity) or narrow-necked bottles (≤0.5-l. capacity), and preserved by heat. Stipulated compositional, organoleptic, physical, chemical and bacteriological requirements include: artificial colouring, no tolerance; DM (refractometer), ≥4.5%; cooking salt (in salted variety), 0.6-1.0%; Cu, ≤5 mg/l.; Sn (canned product), ≤100 mg/l.; Pb (canned product), no tolerance. Regulations on methods on analysis, packaging, labelling, transport, storage (at 0-20°C and ≤75% RH) and supplier's guarantee are listed. SKK

2 U 137
**[Canned food. Beef in own juice.]**
**Roumania**, Institutul Roman de Standardizare
***Roumanian Standard*** **STAS 4329-71** 3pp. (1971) [Ro]

The standard refers to beef sterilized in a hermetically sealed container. Use of meat exhibiting any pathological condition is prohibited. Detailed specifications are given for visual appearance of the product at 10°C and after warming to 40°C, and (at 40°C only) for colour of the meat, fat and juice, and flavour and texture of the meat. Methods of analysis are prescribed for determination of % fat-free meat and % fat; for determination of % NaCl, mg/100 g ammoniacal N, mg/kg Sn and mg/kg Pb reference is made to other standards. General requirements for packaging, labelling, storage and transport are included. ELC

2 U 138
**[Canned food. Pork in own juice.]**
**Roumania**, Institutul Roman de Standardizare
***Roumanian Standard*** **STAS 1089-71** 3pp. (1971) [Ro]

The standard refers to pork sterilized in a hermetically sealed container. Use of meat exhibiting any pathological condition or from sows in advanced gestation is prohibited. Detailed specifications are given for visual appearance of the product at 10°C and after warming to 40°C, and (at 40°C only) for colour of meat, fat and juice, and flavour and texture of the meat. Methods of analysis are prescribed for determination of % fat-free meat and % fat; for determination of % NaCl, mg/100 g ammoniacal N, mg/kg Sn and mg/kg Pb reference is made to other standards. General requirements for packaging, labelling, storage and transport are included. ELC

2 U 139
**[Vegetable products: dried vegetables.]**
**Poland**, Polski Komitet Normalizacyjny
***Polish Standard*** **PN-72/A-77603** 11pp. (1972) [Pl]

This standard replaces **PN-63/A-77603** and covers dried red beet, onion, horseradish, garlic, green peas, cauliflower, white and red cabbage, savoy, dill leaves, parsley leaves, celery leaves, carrot, parsnip, parsley, leek and celery, whole, sliced, in granular or flour form, as well as mixtures of the named vegetables, intended for the home market. Definitions and stipulated organoleptic, physical and chemical requirements include, apart from those for individual vegetables, the following common to all: organic impurities of animal origin, no tolerance; As, Pb, Zn, Cu and Sn respectively $\leqslant 1$, $\leqslant 2$, $\leqslant 50$, $\leqslant 30$ and $\leqslant 200$ mg/kg DM. Regulations on packaging, storage, transport and methods of analysis are listed. SKK

3 C 78
**[Lead solubility of glazes and decorations on utility items. Analysis and legislative evaluation.]**
Bleilässigkeit von Glasuren und Dekoren auf Bedarfsgegenständen. Analytik und lebensmittelrechtliche Beurteilung.
Fey, R.; Becker, G.
***Zeitschrift für Lebensmitteluntersuchung und -Forschung*** **150** (2) 87-93 (1972) [11 ref. De, en] [Chem. Untersuchungsamt für das Saarland, Saarbrücken, Federal Republic of Germany]

The legal aspects in various countries of Pb solubility of glazes and decorations on utility items are discussed and it is pointed out that the zero tolerance of the German Lead/Zinc Regulations of 1887 is no longer tenable in view of the sensitivity of modern analytical methods. 24-h treatment at room temp. with 4% acetic acid is recommended for extraction of soluble Pb from the items, followed by atomic absorption analysis or determination by the chromate method of the German Federal Republic standard DIN 51031 (with filtration through filter paper replaced by sintered glass filtration, and precipitation carried out in a beaker instead of a measuring flask). A max. tolerance limit of 2 mg soluble Pb/$dm^2$ of utensil is suggested. SKK

3 J 329
**Lead, arsenic, and copper content of crops grown on lead arsenate-treated and untreated soils.**
Chisholm, D.
***Canadian Journal of Plant Science*** **52** (4) 583-588 (1972) [12 ref. En, fr] [Res. Sta., Canada Agric., Kentville, Nova Scotia]

Increased lead and arsenic concentrations in the surface soil (0-15 cm), resulting from applications of lead arsenate ($PbHAsO_4$), increased both lead and arsenic levels in crops grown on treated plots. The lead levels in some crops approached or exceeded the Canadian residue tolerance of 2.0 ppm. Lead arsenate soil treatments did not affect copper absorption by crops. On areas such as old orchard land contaminated with lead arsenate residues it may be advisable to ascertain the soil lead status before planting certain crops, and also to determine the lead affinity and arsenic sensitivity of the plants to be grown. AS

3 J 353
**[Determination of lead in vegetables by atomic absorption spectrophotometry.]**
Damiani, P.
***Industrie Alimentari*** **11** (9) 106-110 (1972) [54 ref. It, en] [Istituto di Chimica Bromatologica, Univ., Perugia, Italy]

Pb traces in 30 samples of salad, chicory, cabbage and beets collected near Perugia were determined by co-precipitating Pb as the sulphate with a strontium carrier and using dilute $H_2SO_4$, converting the precipitate to the carbonate, dissolving this in 1N $HNO_3$ and then determining the Pb by atomic absorption analysis. Results, presented as ppm of the edible part of the vegetable, vary as follows: salad, 0.114-0.392; chicory, 0.217-0.882; cabbage, 0.231-0.906; and beets, 0.195-0.578. These results show that the method used is very sensitive and that taking into account the amount of traffic in the region the Pb contamination is fairly low. LA

3 R 140
**Determination of lead in fish by furnace atomic absorption.**
Pagenkopf, G. K.; Neuman, D. R.; Woodriff, R.
***Analytical Chemistry*** **44** (13) 2248-2250 (1972) [12 ref. En] [Dept. of Chem., Montana St. Univ., Bozeman, 59715, USA]

A report is presented of a method of Pb analysis in fish using furnace atomic absorption. For fish muscle tissue samples tested the detection limit was 0.15 ng/g with an absolute sensitivity of $5.5 \times 10^{-12}$ g. The procedure appeared to be free of matrix effects and it is suggested that it is applicable to Pb analysis in any type of tissue or bone sample. AA

4 A 203
**[Separation and determination of Pb (II), Cu (II) and Zn ions by paper chromatography.]**
Maneva, D.; Pavlova, I.
***Nauchni Trudove, Vissh Institut po Khranitelna i Vkusova Promyshlennost*** **17** (2) 341-349 (1970) [9 ref. Ru, de]

4 A 214
**[Polarographic determination of Cu, Pb, Fe, Zn and their mixtures.]**
Romani, B.
***Bollettino dei Laboratori Chimici Provinciali*** **22** (4) 721-734 (1971) [It, fr, en, de] [Lab. Chimico Provinciale di Udine, Italy]

Use of differential cathode ray polarography to simultaneously measure amounts of Cu, Pb, Fe and Zn in foodstuffs is studied. No foodstuffs are specifically mentioned and the experiments are carried out on solutions of the metal salts. Results are calculated according to a series of formulae and results are given for solutions containing a single metal, a combination of any 2 metals both in amounts of 10 mg/l. and 20 mg/l. or one as 10 mg/l. and the other as 20 mg/l. (with the exception of Zn) and combinations of 3 metals (excluding Zn) in amounts of 10 mg/l. and 20 mg/l. each and of all 4 metals in amounts of 20 mg/l. each. Results show that it is possible to determine Cu and Pb simultaneously in the presence of Fe and Zn in alkaline media; Zn cannot be measured by this method and interferes with the estimation of Fe. LA

4 H 636
**[Solder effect on lead content of canned orange juice.]**
Cavalcanti de Barros, G.
***Arquivos da Universidade Federal Rural do Rio de Janeiro*** **1** (1) 51-60 (1971) [25 ref. Pt, en] [Dept. de Tecnologia, Univ. Fed. Rural, Rio de Janeiro, Brazil]

Various batches of natural and concentrated orange juice were canned and stored for up to 175 days, and Pb content was determined by various methods in a search for a simpler method for the determination than that of the Analytical Methods Committee [Analyst (1959) **84**, 127]. Atomic absorption spectroscopy (after wet oxidation) was found to be no more convenient than the standard colorimetric method, which was generally adopted. Pb content was variable, but some uncanned natural juice contained as much as 0.45 ppm rising to 0.52 ppm after canning and storage. It is generally concluded that the can solder (except where an in-can fermentation occurs) is generally responsible for only a small proportion of the total Pb content of canned orange juice. ECA

4 J 495
**Lead and cadmium content of some vegetable foodstuffs.**
Thomas, B.; Roughan, J. A.; Watters, E. D.
***Journal of the Science of Food and Agriculture*** **23** (12) 1493-1498 (1972) [24 ref. En] [Min. of Agric., Fisheries and Food, Plant Pathology Lab., Hatching Green, Harpenden, Herts, UK]

An analytical method and results are given for the determination of lead and cadmium in Brussels sprouts, apples, pears, cabbages, potatoes, onions, leeks, carrots, swedes, watercress, frozen vegetables, cucumber, celery, tomatoes, mushrooms and dried herbs. The lead content of the 231 samples was in the range 0.01 to 3.85 ppm the mean being 0.05 ppm; the range and mean of the cadmium content were 0.01 to 0.22 and 0.04 ppm, respectively. AS

4 M 346
**Direct contamination of barley with $^{51}$Cr, $^{59}$Fe, $^{58}$Co, $^{65}$Zn, $^{203}$Hg and $^{210}$Pb.**
Aarkrog, A.; Lippert, J.
***Radiation Botany*** **11** (6) 463-472 (1971) [15 ref. En] [Health Physics Dept., Atomic Energy Commission, Res. Establishment Risö, DK-4000 Roskilde, Denmark]

A study of barley sprayed at 6 different stages of development with radionuclides of Cr, Fe, Co, Zn, Hg and Pb. The initial retention followed the equation: $IR = 1\text{-}e^{-0.31g.cm^{-1}}$, where g is the dry wt. of the herbage in a plot in grammes, and cm the height of the plants at spraying. The field loss depended on the growing rate and the developments of the plants and thus varied throughout the growing period. The field loss coeff. $\lambda$ was 0.054 days$^{-1}$ in the 1st part of the period and 0.017 days$^{-1}$ in the 2nd part. If the whole growing season is considered, the loss of activity in % is about equal to the time in days from the spraying to harvest. Zn and Co showed the highest concn. in the grain. The translocation of Cr, Pb and Hg within the plant was small. Fe was translocated to the grain as was Zn, but to a far less extent. AS

4 S 389
**Pesticide and heavy metal residues.**
Spaulding, J. E.
***Proceedings of the Meat Industry Research Conference*** Mar., 11-23 (1972) [4 ref. En] [USDA, Washington, DC 20250, USA]

Pesticide and heavy metal residues in meat and poultry are discussed with special reference to chlorinated hydrocarbon insecticide residues in animals and poultry, and Hg, Pb and Cd levels in liver, muscle and kidney of cattle. The problem of polychlorinated biphenyl residues is also briefly considered. AA

4 S 430
**[Studies of the content of toxic heavy metals in organs of normally slaughtered domestic animals. Preliminary communication. Lead in cattle organs.]**
Untersuchungen über den Gehalt an toxischen Schwermetallen in Organen normalgeschlachteter Haustiere. Vorläufige Mitteilung: Blei in Rinderorganen.
Grahwit, G.
***Archiv für Lebensmittelhygiene*** **23** (10) 213-215 (1972) [8 ref. De, en] [Inst. für Hygiene und Tech. des Fleisches, Tierärztliche Hochschule, Hanover, Federal Republic of Germany]

In a preliminary investigation, samples taken from 20 freshly slaughtered cattle were analysed for Pb content by atomic absorption spectrometry. Aveage values (mg Pb/kg) were: liver 0.23, kidney 0.42, muscle 0.42 and spinal cord 0.22. Pb levels were related to geographical location. 10 animals from a pollution-free area gave most values <0.1 mg/kg, but 5 animals from a heavily polluted area showed severe symptoms of Pb poisoning and gave values of liver 18.0-22.8, kidney 32.2-62.8 and muscle <0.1. ELC

4 U 205
**A note on the standard for lead in drinking water.**
Amphlett Williams, H.
***Journal of the Association of Public Analysts*** **10** (3) 71-73 (1972) [9 ref. En] [Muter & Hackman, 325 Kennington Rd., London SE11 4QE, UK]

The maximum allowable limit for Pb in drinking water has been increased by WHO, in the Third Edition of "International Standards for Drinking Water" (1971), from 0.05 mg/l, where it has remained since 1963, to 0.1 mg/l. This increase is discussed and arguments against it are presented. AA

4 U 251
**Icing sugar.**
Standards Association of Central Africa
***Central African Standard*** **CAS No. S40:1972** 8pp. (1972) [En] Price $0.85 [Salisbury, Rhodesia]

This specification sets out the requirements for one grade of icing sugar. Icing sugar is defined as a finely-ground sugar, containing corn starch or tricalcium phosphate, which has been prepared from sucrose. Factory and employee, general and ingredient requirements are given. Physical requirements cover addition of colouring matter, freedom from foreign matter, grain size (not more than 2% shall remain on a 150 μm BS sieve and not less than 65% shall pass through a 75 μm BS sieve), and net mass. Chemical requirements are: sulphated ash, %, 1.25; moisture, %, max. 0.10; total reducing sugars, %, max. 0.030; corn starch, %, max. 3.0; tricalcium phosphate, %, max. 1.0; As, mg/kg, max. 1; Pb, mg/kg, max. 1. Microbiological requirements are: total colony count ≤100 colonies/g sugar; yeasts 0/g sugar; mould spores ≤10/g sugar. Requirements also cover packets, packing, storage, labelling, marking and sampling. Appendices list methods for physical, chemical and microbiological analysis. JA

4 U 255
**[Wheat-gluten bread, 'Diabetic' type.]**
**Bulgaria**, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 9180-71**, 4pp. (1971) [Bg]

The bread shall meet the following requirements: wt. of loaf, 1000 g ± 3% or 500 g ± 4%; DM, ≥59%; moisture, ≤47.5%; porosity, ≥75%; acidity, ≤2° Neuman; salt (in terms of DM), ≤1%; Pb salts, ≤0.3 mg/kg; As salts, ≤0.2 mg/kg; pathogens and moulds, no tolerance. The standard also covers sampling, testing, packaging (unwrapped or in polyethylene film), storage and transport. The shelf life of the product is set at ≤72 h. HBr

4 U 257
**[Wheat flour, type 450.]**
**Bulgaria**, Komitet po Kachesvoto, Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 9487-72**, 3pp. (1972) [Bg]

This standard applies to wheat flour with a natural rye content of ≤8%. Moisture content shall be ≤14.5%; total ash (in terms of absolute DM) ≤0.450%; acid-insoluble ash ≤0.1%; acidity ≤3° Neuman; wet gluten ≥28%; foreign matter ≤0.06%; Zn, Pb, Cu no tolerance; Fe ≤0.02 mg/kg; content of corn-cockles ≤0.02; and content of germinated grain ≤3%. Requirements for packaging, storage and transport are also given. HBr

4 U 258
**[Wheat flour, type 700.]**
**Bulgaria**, Komitet po Kachestvoto,
Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 1872-72**, 4pp. (1972)
[Bg]

This standard, which replaces **BDS 1872-66**, applies to wheat flour with a natural rye content of ≤8%. Requirements include: moisture, ≤14.5%; total ash, ≤0.7%; acid-insoluble ash (in terms of DM), ≤0.1%; wet gluten, ≥26%; foreign matter, ≤0.06%; Zn, Pb, Cu, no tolerance; Fe, ≤3 mg/kg (particle size, ≤0.3 mm); corn-cockle, ≤0.02%; germinated grain, ≤3%. Requirements are also laid down for packaging and storage (≤10 months). HBr

4 U 259
**[Wheat flour, type 1150.]**
**Bulgaria**, Komitet po Kachestvoto,
Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 9488-72** 3pp. (1972)
[Bg]

This standard, which partially supersedes **BDS 2684-66**, applies to wheat flour with a natural rye content of ≤8%. Moisture content shall be ≤14.0-14.5%; ash (in terms of absolute DM), ≤1.15%; acid-insoluble as ≤0.1%; acidity ≤5° Neuman; wet gluten ≥25%; foreign matter ≤0.06%; corn-cockles ≤0.2%; germinated grains ≤3%; Zn, Pb, Cu no tolerance; Fe ≤3 mg (max. particle size 0.3 mm). Requirements for packaging, storage and transport are also given. HBr

4 U 261
**[Roasted ground chick-pea.]**
**Bulgaria**, Komitet po Kachestvoto,
Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 9206-71**, 3pp. (1971)
[Bg]

This standard applies to roasted ground chick-pea intended for use as an additive to or replacement for coffee. The product shall meet the following requirements: moisture, ≤7%; total ash (in terms of DM), ≤3.5%; acid-insoluble ash, ≤0.5%; extractives, ≥22%; Cu salts, ≤10 mg/kg, Pb salts, ≤0.3 mg/kg; As salts, ≤0.2%; pathogenic microorganisms, artificial colouring and foreign bodies, no tolerance. The product shall pass through a 0.8 mm sieve. The standard also covers sampling, testing, packaging (parchment, cellophane or polyethylene film in outer carton), storage (≤20°C, ≤75% RH) and transport. The shelf-life of the product is set at ≤9 months. HBr

4 U 305
**[Wheat flour, type 500.]**
**Bulgaria**, Komitet po Kachestvoto,
Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 2684-72**, 4pp. (1972)
[Bg]

This standard, which replaces **BDS 2684-66**, applies to wheat flour with a natural rye content of ≤8%. Requirements include: moisture, ≤14.5%; total ash (in terms of DM), ≤0.50%; acid-insoluble ash, ≤0.1%; acidity (in terms of absolute DM), ≤3° Neuman; wet gluten, ≥24%; foreign matter, ≤0.06%; corn-cockle, ≤0.2%; germinated grain, ≤3%; Zn, Pb, Cu, no tolerance; Fe, ≤3 mg/kg (particle size, ≤0.3 mm). The standard also covers packaging, storage and transport. Shelf life of the product is set at ≤10 months. HBr

5 B 55
**[Metals in liquid smokes.]**
Shiraishi, Y.; Kuzuhara, Y.; Sakagami, Y.
***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** **12** (3) 216-219 (1971) [1 ref. Ja] [Dept. Public Health Pharmaceutics, Inst. of Public Health 6-1, Shiroganedai 4-chome, Minato-ku, Tokyo, Japan]

Metals in 26 commercial liquid smokes for food processing were analysed by atomic absorption method. The data for Pb, Zn, Cu, Cd, Mn, Co and Ni are tabulated in English. TM

5 C 105
**[Pollution by lead.]** [Review]
Truffert, L.
***Annales des Falsifications et de l'Expertise Chimique*** **65** (698) 51-103 (1972) [167 ref. Fr]

This review discusses the subject under the following headings: toxicity; metabolism of Pb; biochemical action of Pb in the body; absorption of Pb from different sources by the body; Pb content in the human body; significance of the Pb content of blood and urine; water pollution by Pb; contamination of food by Pb; contamination of the atmosphere by Pb; atmospheric Pb pollution in France, particularly Paris; and does Pb pollution constitute a danger? An appendix describes a method for determining Pb in air and blood. JA

5 C 132
**[Modern encyclopaedia of food hygiene. Vol. IV. Food poisoning.]** Encyclopedie moderne de l'hygiene alimentaire. Tome IV. Les intoxications alimenntaires. [Book]
Lederer, J.
156pp. (1970, publ. 1971) [Fr]

The following aspects are dealt with: toxins of bacterial origin; toxic components in plant foods; contamination of foods by radioactive elements such as $^{90}$Sr, $^{137}$Cs and $^{131}$I; toxic components in fish and related products; food additives; colorants; contamination of foods with metallic salts; pesticide residues; and antibiotic residues. AA

5 G 250

**[Meeting of the Northern Section of the German Chemists' Society's Specialist Group 'Food Chemistry & Judicial Chemistry', 10th March 1972, in Hanover.]** Sitzung des Arbeitskreises Nord der GDCh-Fachgruppe 'Lebensmittelchemie und gerichtliche Chemie', am 10. März 1972 in Hannover.

**Federal Republic of Germany**, Gesellschaft Deutscher Chemiker

***Mitteilungsblatt der GDCh-Fachgruppe Lebensmittelchemie und Gerichtliche Chemie* 26** (8) 149-156 (1972) [De]

Resumes are given of papers read at the meeting, and include: Binding of volatile aroma compounds to starch, by H. G. Maier; Analysis of heavy metals in foods by atomic absorption spectrophotometry, by U. Gieger (6 ref.); Rationalization of crude protein determination, by G. Dickhaut; Semi-automatic N determination in foods of animal origin by the Dumas technique, by E. Spell; Determination of available lysine in milk products with Remazol Brilliant Blue R, by K. H. Ney; Flavone and flavonol contents of fruit and some vegetables, by K. Herrmann & W. Wildinger; Bitterness in hazelnuts, by W. Sturm (4 ref.); Keeping characteristics and storability of deep-frozen products, by F. Timm (6 ref.); and Spectral analytical identification and determination of thiabendazole (in citrus fruit and bananas), by H. Hey (1 ref.). HBr

5 U 332

**Health laws and regulations - Australia (New South Wales).**

World Health Organization

***International Digest of Health Legislation* 23** (1) 3-12 (1972) [En] [Geneva, Switzerland]

A selection of New South Wales health laws and regulations is presented including the following which relate to food hygiene: New South Wales - Regulations under the Pure Food Act, 1908, are further amended to make provisions for labelling of foodstuffs (dated 24 Dec., 1968), and low calorie food, prawns and shrimps (dated 18 April, 1969); an Act (No. 18 of 1969) to amend the Meat Industry Act of 1965 in certain particulars notably relating to poultry processing (17 Dec., 1969); Amendments to the Food and Drug Regulations, 1964, made under the Health Act 1937-1968 (13 March, 1970) (the most significant amendments relating to poisonous metals in foods, antioxidants and modifying agents and vitamins and minerals); Amendments to the Dairy Produce Regulations of 1936, made under the Dairy Produce Acts, 1920 to 1963 (26 March, 1970) (establish standards for various categories of milk and milk products or ingredients used in their preparation); Amendments to the Food and Drug Regulations, 1964, made under the Health Act 1937-1968 (9 Nov., 1970) (relating to edible fats and oils and margarine); Amendments to the Food and Drug Regulations, 1964, introducing a new version of Regulation 13 which relates to artificial sweetening substances (3 Dec., 1970). VJG

6 G 282

**[The first conference of German food chemists of the food chemistry and forensic chemistry group of the German Chemical Society held on 4-6 Oct. 1972 in Braunschweig.]** Der erste Deutsche Lebensmittelchemikertag der Fachgruppe "Lebensmittelchemie und gerichtliche Chemie" in der Gesellschaft Deutscher Chemiker, vom 4. bis 6. Oktober 1972 in Braunschweig.

**Federal Republic of Germany**, Gesellschaft Deutscher Chemiker, Fachgruppe "Lebensmittelchemie & gerichtliche Chemie"

***Deutsche Lebensmittel-Rundschau* 69** (1) 1-64 (1973) [many ref. De]

The following papers presented at the conference are given in full: Introduction, by H. Lange (pp. 1-3); Indicators of initial quality changes in foods, by K. Eichner (pp. 4-12, 113 ref.); Observations on reaction kinetics in the heat sterilization of foods, by P. Nehring (pp. 12-20, 23 ref.); Problems in the manufacture of semi-preserved fish products, by V. Meyer (pp. 20-25); Present food legislation, by D. Eckert (pp. 25-28); Collision between weights and measures legislation and food legislation?, by J. Peters (pp. 29-32); Keeping quality and preservation of liquid milk products, by E.-G. Samuelsson (pp. 32-35); Pesticides residues in Danish foods from animal sources (milk and milk products, eggs, meat, fish), by H. Werner (pp. 35-39, 5 ref.); Problems in the analysis of biocide residues in relation to protection of the environment, by W. Ebing (pp. 39-45, 97 ref.); Heavy metals in plants used for food and feed, by A. Kloke (pp. 45-49, 40 ref.); Potato quality as the goal in research on cultivation, by D. Bommer (pp. 49-54, 11 ref.); Protein quality of foods and feeds, by E. Schulz (pp. 55-59, 48 ref.); and Preventive and repressive measures in the manufacture, packaging and control of foods, by W. Gögge (pp. 60-64, 7 ref.). JA

7 A 310

**Some sensitivities of some heavy metals in typical environmental matrices.** (In "Trace substances in environmental health - V.")

Eckhoff, N. D.; Ervin, P. F.; Clack, R. W.; Lambert, J. P.

pp. 455-462 (1972) [11 ref. En] Columbia, Missouri, USA, Univ. of Missouri [Dept. of Nuclear Eng., Kansas St. Univ., Manhattan, 66502, USA]

This paper was presented at the University of Missouri's 5th Annual Conference on Environmental Health held on 29th June-1st July 1971. Selection of an analysis technique is often based on its sensitivity. Because of the low allowable environmental concn. for many heavy metals, experimental (as contrasted to calculated) sensitivities for these metals in environmental matrices are important to the analyst in selecting the best analysis procedure. Sensitivities for the analysis of heavy metal elements by neutron activation analysis (NAA) are generally calculated on an interference-free basis. These calculated results are presented for comparison purposes.

However, the more important sensitivities for heavy metals in interference matrices such as water, air filters, and biological materials are calculated using 10% statistics, i.e. a 10% fractional error. The Triga nuclear reactor source was used in these sensitivity calculations. From these results it is readily apparent that NAA is well-suited for some heavy metal analyses; while only moderately good for others; and inadequate for others, e.g. Pb. AS

7 C 172

**Air and water pollution by cadmium, lead and zinc attributed to the largest zinc refinery in Japan.** (In "Trace substances in environmental health - V.")
Kobayashi, J.
pp. 117-128 (1972) [5 ref. En] Columbia, Missouri, USA, Univ. of Missouri [Inst. for Agric. and Biol. Sci., Okayama Univ., Kurashiki, Japan]

This paper was presented at the University of Missouri's 5th Annual Conference on Environmental Health held on 29th June-1st July 1971. In Annaka City, Cunma Prefecture, where the largest Zn refinery in Japan is located, about 200 samples of agricultural products, soil, silkworms, and excrement of farmers were collected and analysed to study environmental pollution by the refinery. It was found that the content of Cd and other metals in mulberry leaves for silkworms and in wheat flour shows a remarkable correlation with distance from the refinery chimney. The content of Cd and other metals is remarkably higher in leaf vegetables, such as cabbages, than in root vegetables, fruit vegetables, or cereals. It appeared that hilly regions higher than the refinery are polluted only by metal-containing air, while the lower rice field regions are affected by polluted waste water as well as polluted air. AS

7 H 1015

**[Hygienic chemical aspects of tea-bags.]**
Kamikura, M.
***Bulletin of the National Institute of Hygienic Sciences [Eisei Shikenjo Hokoku]*** **90**, 126-128 (1972) [3 ref. Ja, en]

Tea-bags were examined by Japanese Official Methods for Plastics Containers and Equipment, except that 1 ml of solvent/square 2 cm of tea-bag paper was used. Formaldehyde was not detected. Levels of Pb, Cu and Zn found by polarography in tea-bag paper were 0.0-1.5, 1.0-8.7 and 1.0-4.5 ppm respectively. AS

7 J 893

**[The effect of processing on the content of heavy metals in fruit and vegetable products. I. Lead contamination of apples and the residue of lead in the production of clear apple juice.]** Einfluss der Verarbeitung auf den Schwermetallgehalt in Frucht- und Gemüseprodukten. I. Die Bleikontamination in Äpfeln und der Verbleib des Bleis bei der Herstellung von klarem Apfelsaft.
Bielig, H. J.; Bolstorff, S.; Treptow, H.
***Deutsche Lebensmittel-Rundschau*** **68** (9) 277-280 (1972) [11 ref. De, en, fr] [Inst. für Frucht- & Gemüsetech., Fachbereich Lebensmitteltech., Tech. Univ., Berlin (West)]

The Pb content of 24 samples of apples of different variety and origin was determined using the dithizonate method of Riebartsch & Gottschalk [Z. Analyt. Chem. (1965) **214**, 179-185]. An average value of 0.266 ppm Pb was found, showing a variation of 0.05 to 0.61 ppm. Pb was more concentrated in peel than in pulp. It could be partly removed by rinsing with water which can be important for apple juice production. During apple juice production a significant amount of Pb goes with the pomace depending on the yield of juice: a smaller Pb content in turbid juice is due to reduced pressing. Furthermore, the Pb content is reduced by enzymatic clarification and fining. AS

7 M 917

**Lead uptake and corn growth with soil-applied lead.**
Baumhardt, G. R.; Welch, L. F.
***Journal of Environmental Quality*** **1** (1) 92-94 (1972) [14 ref. En] [Agronomy Dept., Univ. of Illinois, Urbana, 61801, USA]

Corn (Zea mays L.) was grown in the field where lead acetate had been soil-applied at 8 rates ranging from 0 to 3200 kg/ha of lead. Emergence plant height, and grain yield were not affected by added lead; neither were any morphological, colour, maturity, or other growth differences visually observed during the 2-yr study. Added lead increased the lead content of stover. Lead content (ppm) of stover for the 0 and 3200 kg/ha treatments were: 2.4 and 37.8 for young whole plants, 3.6 and 27.6 for leaves at tasselling, and 4.2 and 20.4 for whole plants at grain harvest. Lead content of grain averaged 0.4 ppm and was not affected by added lead. AS

7 U 425

**[Food products. Methods of testing.]**
**Colombia**, Instituto Colombiano de Normas Tecnicas
***Colombian Standard*** **ICONTEC 440** 21pp. (1972) [Es] [Bogota, Colombia]

Techniques are prescribed for the following conventional determinations: net wt. and packing density; drained wt.; organoleptic properties; acidity; solids (in solution by refractometry, in suspension by centrifugation); reducing sugars (Lane-Eynon method); ascorbic acid (indophenol method); Cu (volumetric); Pb (dithiazone); As (Gutzeit); essential oils (by reflux condensation); black particles; and mould fragments (microscopical technique). ELC

8 A 382

**[Determination of macro- and microelements in foods and drinking water by atomic absorption spectrophotometry.]** Über die Bestimmung von Mengen- und Spurenelementen in Lebensmitteln und Trinkwasser mit der Atomabsorptions-Spektrophotomertrie.

Müller, U.; Windemann, H.

***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** **63** (4) 485-511 (1972) [7 ref. De, fr] [Kant. Lab., Bern, Switzerland]

Methods are given for the determination of metals by atomic absorption flame photometry in drinking water supplies and various food products, including infant foods, breakfast drinks, fruit concentrates, wine, dried milks, spices, egg whip and wheat germ. Metals covered are Fe, Ca, Cu, Zn (particularly in water), Na and K, Mn (water supplies only), Cd, Pb and P (as phosphomolybdate). For each metal, detailed information is given on preparation of the sample (e.g. time and temp. of ashing, preparation of solutions), operating parameters for the equipment, and accuracy of recovery of known additions. ELC

8 C 238

**[Relation between lead content of plants and lead concentration in the soil.]** Abhängigkeit des Bleigehaltes der Pflanzen von der Bleikonzentration im Boden.

Wagner, K.-H.; Siddiqi, I.

***Naturwissenschaften*** **60** (4) 200 (1973) [1 ref. De] [Inst. für Ernährungswissenschaft II, Univ. Giessen, Federal Republic of Germany]

Experiments were conducted to study the possibility that Pb compounds discharged by motor vehicles may be accumulated in soil and absorbed by the root system of plants. In white cabbage grown 25 m distant from a motorway, Pb contents (ppm in DM) of 125 were detected in leaves, 11.6 in the heart (reduced to 2.3 by washing). The proportions of Pb removable by washing were variable. Barley plants were grown in 6 kg quantities of soil (pH 5.4) containing additions of 0 (control), (i) 2.0, (ii) 20 and (iii) 40 mg $Pb(NO_3)_2$. The plants absorbed Pb in proportions to the amount added to the soil. Pb contents (ppm in DM) were: control, 8.0; (i) 94; (ii) 121; and (iii) 578. ELC

8 C 249

**Lead uptake by lettuce and oats as affected by lime, nitrogen, and sources of lead.**

John, M. K.; Laerhoven, C. van

***Journal of Environmental Quality*** **1** (2) 169-171 (1972) [17 ref. En] [Canada Dept. of Agric., Res. Branch, Agassiz, British Columbia]

Oats and lettuce grown on treated soils in a growth chamber were harvested after 21 and 30 days respectively. Pb content (ppm in DM) in lettuce leaves, oat tops and oat roots respectively after various soil treatments were: 0ppm Pb, 50.0, 4.4, 20.3; 1000 ppm Pb (as $PbCl_2$), 136.9, 37.1, 59.1; 1000 ppm Pb (as $PbCO_3$), 126.0, 28.6, 59.2; 1000 ppm Pb (as $Pb(NO_3)_2$), 140.6, 35.7, 58.6; no lime, 173.7, 40.1, 58.8; 1g/100 g lime, 54.0, 12.8, 39.7; 0 ppm N, 115.1, 28.7, 55.6; 50 ppm N, 101.6, 24.0, 50.4; 500 ppm N, 124.9, 26.6, 42.0. Interaction of lime and Pb treatments significantly affected Pb content of lettuce and oat tops but not oat root content. N application to lettuce in absence of Pb application decreased Pb content. When Pb was added variable results were obtained. When no lime was applied, N gave significantly different levels of Pb in lettuce leaves and oat roots. Application of lime repressed uptake of added Pb by both plants. Low level N application reduced Pb content in lettuce and oat roots, while high level N treatment reduced Pb content in oat roots but had the opposite effect on lettuce. Levels of P and S in lettuce leaves were found to be significantly lower when soil was treated with $PbCl_2$ but levels of other elements studied were not affected by any Pb treatment. The greater susceptibility of lettuce than oats to Pb accumulation emphasizes the importance of selecting Pb-tolerant crops for Pb contaminated soils. VJG

8 H 1166

**Lead in bones and drinking water in towns with hard and soft water.**

Crawford, M. D.; Clayton, D. G.

***British Medical Journal*** **II** (5857) 21-23 (1973) [19 ref. En] [MRC Social Med. Unit, Public Health Dept., London School of Hygiene & Tropical Med., London WC1E 7HT, UK]

96 tap water samples (the first run-off in the morning) were obtained, 39 in 5 hard water and 44 in 5 soft water towns in England and Wales, and 13 in Glasgow (soft water). 14 of the 96 samples had Pb concn. above the conventional safety limit of 0.1 ppm (World Health Organization 1971); values >0.3 ppm were found only in Glasgow. It is pointed out that concn. of Pb which may be harmless in hard water may not be so in soft water; in fact hard water is protective against both pick-up of Pb from pipes and its absorption by the body. Corrective measures at present being applied to water supplies in England and Wales are discussed. AA

8 H 1290

**Lead content of Indian tea.**

Seth, T. D.; Hasan, M. Z.; Sircar, S.

***Bulletin of Environmental Contamination and Toxicology*** **9** (2) 124-128 (1973) [9 ref. En] [Ind. Toxicology Res. Centre, PO No. 80, Lucknow, India]

A random survey was conducted to determine Pb content in Indian tea and its decoctions. Pb content of various samples of tea was found to range from 0.4 to 1.6 ppm and in decoctions it ranged from 0.002 to 0.012 mg/l. The effect of temp.[30-90°C] and pH [4.0-9.0] was also studied and it was found that a larger amount of lead was leached out in the decoctions at low pH and at high temp. AS

8 J 1083

**[A study of toxic pesticide residues in foods. II.]**

Ro, C. B.; Song, C.; Yun, K. D.; Kim, K. K.; Kwon, H. H.; Kim, Y. S.

***Report of the National Institute of Health*** 6, 237-250 (1969) [12 ref. Ko, en] [Nat. Inst. of Health, Seoul, Korea]

Investigations of toxic pesticide residues in strawberries, melons, cucumbers, water melons, peaches respectively gave the following results (ppm); As, 0.1-0.8, 0.6-1.5, 0.5-1.3, 0.4-12, 0.6-1.2; Pb, 0.04-0.20, 0.2-0.9, 0.3-0.6, 0.1-0.26, 0.1-0.2; organic Hg, -, 0.01-0.03, -, 0.01-0.06, 0.01-0.03; DDT, -, 0.05-0.12, 0.05-0.14, 0.02-0.12, 0.07-0.13; parathion, -, trace-0.08, trace-0.07, trace-0.03, 0.03-0.21. KoSFoST

8 J 1084

**[A study of toxic pesticide residues in food. III.]**

Ro, C. B.; Song, C.; Kim, K. K.; Yun, K. D.; Kwon, H. H.

***Report of the National Institute of Health*** 7, 237-248 (1970) [14 ref. Ko, en]

Ranges of values for toxic contaminants found in food were (ppm): As, 0.050-0.6; Pb, 0.06-0.91; Cu, 0.11-1.7; organic mercury, 0.0-0.4; and γ-BHC, 0.009-0.04. [See also preceding abstr.] KoSFoST

8 J 1230

**Lead and cadmium content of some canned fruit and vegetables.**

Thomas, B.; Roughan, J. A.; Watters, E. D.

***Journal of the Science of Food and Agriculture*** 24 (4) 447-449 (1973) [7 ref. En] [Min. of Agric., Fisheries & Food, Plant Path. Lab., Hatching Green, Harpenden, Herts, UK]

The levels of Pb and Cd have been determined in samples of canned tomatoes, blackcurrants, grapefruit, pineapples, apricots, oranges, peaches, rhubarb, apples, prunes, damsons, plums, spinach and baked beans. The Pb content of the 76 samples was in the range 0.10 to 3.90 ppm, the mean being 0.56 ppm; the range and mean of the Cd content were 0.01 to 0.18 and 0.02 ppm, respectively. AS

8 J 1245

**Lead in grapes exposed to automobile exhaust gases.**

Pertoldi Marletta, G.; Favretto Gabrielli, L.; Favretto, L.

***Journal of the Science of Food and Agriculture*** 24 (2) 249-252 (1973) [11 ref. En] [Istituto di Merceologia, Univ. di Trieste, 34100, Italy]

Lead accumulates in grapes exposed to automobile exhaust gases, the concn. of the metal diminishing parabolically with the logarithm of the distance from the source of pollution. The max. extrapolated figure was 4-6 µg/g of dried grapes, or about 10 times the normal content. The pollution falls to zero 100 to 120 m away from the roadway. AS

8 R 353

**Reduction of mercury with cysteine in comminuted halibut and hake fish protein concentrate.**

Spinelli, J.; Steinberg, M. A.; Miller, R.; Hall, A.; Lehman, L.

***Journal of Agricultural and Food Chemistry*** 21 (2) 264-268 (1973) [17 ref. En] [US. Dept. of Commerce, Nat. Oceanic and Atmospheric Administration, Nat. Marine Fisheries Service, Pacific Fishery Products Tech. Center, Seattle, Washington 98112, USA]

A study was made to determine the effectiveness of cysteine in reducing the Hg content of comminuted fish and fish protein concentrate (FPC). Comminuted fish tissue was extracted with 0.1M NaCl containing cysteine $HCl \cdot H_2O$ in concn. ranging from 0 to 0.5%. The amount of Hg that could be extracted from the fish was related to the concn. of cysteine and the pH of the tissue, but the relation was not linear. Fish blocks were prepared from the cysteine-extracted comminuted tissue and did not develop off-flavour during storage. When cysteine was added to isopropyl alcohol to prepare FPC, the Hg in the FPC was reduced up to 50%. AS

8 T 388

**Evaluation of certain food additives and of the contaminants mercury, lead and cadmium. Sixteenth report of the Joint FAO/WHO expert committee on food additives.**

Food & Agriculture Organization; World Health Organization

***FAO Nutrition Meetings Report Series*** No. 51, 32pp. (1972) [En] [Rome, Italy]

This report deals with the evaluation of certain intentional additives (amaranth, caramel colours made by the ammonia process, diethyl pyrocarbonate and octyl gallate) and toxic metals (Hg, Pb and Cd) in foods. Aspects considered include methods of analysis, levels of toxic metals in food and the environment, principles of toxicological evaluation, comments on individual substances, establishment of control measures, and recommendations. 2 annexes give reports and other documents resulting from previous meetings of the FAO-WHO Expert Committee on Food Additives, and tolerable and acceptable daily and weekly intake levels for the additives and metals studied. AJDW

9 H 1397

**Health hazards of persistent substances in water.**

Hernberg, S.

***WHO Chronicle*** 27 (5) 192-193 (1973) [1 ref. En] [Res. Office, Inst. of Occupational Health, Helsinki, Finland]

The recommendations of a working group convened by the WHO Regional Office for Europe and the Institute of Occupational Health, Helsinki, Finland, with reference to max. permissible levels of As, Cd, Pb, Mn and Hg in drinking water were as follows (mg/l.): As, 0.05; Cd, 0.005; Pb, 0.05; Mn, 0.5; and Hg, 0.001. The levels recommended for Cd and Pb are half those endorsed by WHO in 1971. AA

9 J 1469

**Enhancement of trace-element content of cabbages grown in urban areas.**

Purves, D.; Mackenzie, E. J.

***Plant and Soil*** **33** (2) 483-485 (1970) [10 ref. En] [Edinburgh School of Agric., UK]

A comparison was made between content of trace elements in cabbages grown in urban and rural areas to ascertain any changes due to soil contamination. Significantly higher contents of B, Mo and Zn were observed in cabbages from urban than in those from rural areas (28.8, 1.83 and 30.2 ppm respectively against 21.0, 1.15 and 20.9 ppm). Levels of extractable B, Cu, Pb, Ni and Zn were markedly enhanced in urban soils (1.78, 33.0, 3.94, 2.60 and 64.5 ppm respectively against 1.10, 11.5, 0.55, 1.86 and 11.3 ppm for rural soils) but there was no corresponding enhancement in levels of Cu, Pb and Ni in the cabbages. PG

9 R 455

**Some heavy metals in sprat (Sprattus sprattus) and herring (Clupea harengus) from the inner Oslofjord.**

Andersen, A. T.; Dommasnes, A.; Hesthagen, I. H.

***Aquaculture*** **2** (1) 17-22 (1973) [2 ref. En] [Lab. for Marine Zoology and Marine Chem., Univ., Oslo 3, Norway]

A base-line study was performed in the Oslofjord to determine concn. of Cu, Zn, Cd and Pb in age-groups 0 and 1 of sprat (Sprattus sprattus L.) and in 0-group of herring (Clupea harengus L.). Values were measured with an atomic absorption spectrophotometer and are tabulated. Highest Cu levels were 8.5 μg/g dry wt. of age group 0 of sprat and 4.3 μg/g dry wt. of herring. Highest Zn levels were 210 μg for age group 1 of sprat and 140 μg for herring. Highest Cd levels were ≤0.2 μg for all and highest Pb levels were 21.8 μg for age 0 sprat and 12.2 μg for herring. CRI

9 U 628

**Methods of sampling and analysis for sugar confectionery.**

**India**, Indian Standards Institution

***Indian Standard*** **IS:6287-1971** 38pp. (1971) [En] [New Delhi]

Detailed specifications are given for methods of sampling, for selection of samples in relation to size of container and size of lot and for number of tests. Detailed laboratory procedures are prescribed for the following analyses: moisture content (vacuum drying, 80 ± 1°C, 6 h); sulphated ash; acid-insoluble ash; reducing sugars and sucrose (Fehling's solution methods); fat (Soxhlet extraction); protein (Kjeldahl method with total protein as N × 6.25); sulphur dioxide (by distillation); As (Gutzeit method); Pb (dithizone method); Cu (spectrophotometric and gravimetric methods); Zn (purification from other metals and dithizone method); Sn (gravimetric determination as $SnO_2$). ELC

10 C 271

**Monitoring for heavy metals.**

Tolan, A.

***Nutrition and Food Science*** No. 30, 13-15 (1973) [6 ref. En]

Most heavy metals present no problem from the point of view of food contamination; only Pb, Hg and Cd are of real interest. In the UK. a survey monitored amounts present in individual foods, determined whether any food might present special problems, and checked food from areas which might be affected by local contamination of the environment. Results showed amounts of Hg to be generally <0.005 mg/kg (with the exception of fish, 0.06-0.07 mg/kg, and shellfish). Total Hg concn. in the average diet was estimated at 0.0065 mg/kg. Mean Pb concn. in the diet was estimated at not more than 0.13 mg/kg, so that total daily amount consumed was approx. 200 μg. Mean Pb content of foods ranged from 0.24 mg/kg for green vegetables to 0.03 mg/kg for milk. Cd content of food is currently being monitored. PG

10 C 272

**[Pollution of fields bordering on the Lausanne-Geneva motorway by gaseous lead from the exhausts of motor vehicles.]**

Quinche, J.-P.; Curzydlo, J.

***Revue Suisse d'Agriculture*** **4** (6) 196-202 (1972) [15 ref. Fr, it, de] [Sta. Fed. de Recherches Agronomiques, Lausanne, Switzerland]

A study was made of the levels of Pb occurring in pasture plants (e.g. lucerne, clover) growing in fields bordering on the Lausanne-Geneva motorway. High levels were found, which varied according to the distance of the plant from the road. The effects on animals (cows, sheep) of feeding with hay contaminated with Pb are also reported. An increase was noted in the Pb content of various organs and milk. The largest accumulation occurred in the bones. JA

10 U 688

**The lead in food (amendment) regulations 1972.**

**UK**, Minister of Agriculture, Fisheries & Food; **UK** , Secretary of State for Social Services

***Statutory Instruments*** No. 1843, 2pp. SBN 11 021843 4 (1972) [En] London, UK, H. M. Stationery Office Price £0.03

These regulations, which came into force on 1st Jan. 1973, restrict to 0.5 ppm the amount of Pb which may be present in food specially prepared for consumption by babies and young children. CDP

11 A 502

**The determination of lead in foods by atomic-absorption spectrophotometry.**

Roschnik, R. K.

***Analyst*** **98** (1169) 596-604 (1973) [33 ref. En] [Nestle Products Tech. Assistance Co. Ltd., Control Lab., Case Postale 88, Ch-1814 La Tour-de-Peilz, Switzerland]

Rapid procedures for the determination of Pb in foods by an organic extraction technique and atomic-absorption spectrophotometry are described. The food sample can be dry ashed or digested by using $H_2SO_4$ and $H_2O_2$. In the latter instance, digestion need not be complete. Pb is extracted from acidic solutions (either the dissolved ashes or the residual solution after acid digestion) into xylene as its diethylammonium diethyldithiocarbamate chelate, and then determined by use of atomic-absorption spectrophotometry. Large amounts of Fe and Sn do not interfere in the determination. In a 10-g sample, 0.02 ppm of Pb can be detected. The SD in the range from 0.2 to 1.0 ppm of Pb is about 0.02 ppm. Certain products do not require preliminary digestion; in these instances Pb is extracted directly from the acidified sample. Liquids, beverages and many canned foods can be monitored very rapidly in this way. The chelate-solvent combination used in this method is more convenient than the ammonium tetramethylenedithiocarbamate-isobutyl methyl ketone system. The method is applicable also to metals other than Pb; its use for Cd has been demonstrated successfully. AS

11 C 297

**[Toxic residues in foods of animal origin.]** [Lecture]

Richou-Bac, H.

***Euroviande - Courrier des Abattoirs*** **14** (76) 27-40 (1973) [15 ref. Fr] [Lab. Central de Recherches Vet., F-94-Maisons-Alfort, France]

The author discusses the presence of unintentional contaminants, such as Hg, Pb, radioactive elements and pesticides in foods, and of the presence of intentionally administered substances, such as antibiotics, therapeutic agents, hormones and insecticides. A brief outline is given of pesticide residues found in milk products, meat, game and fish. Recommended tolerance levels for different types of foods are summarized in 6 tables. MEG

11 C 308

**Collaborative study of an atomic absorption method for the determination of lead and cadmium extracted from glazed ceramic surfaces.**

Krinitz, B.; Franco, V.

***Journal of the Association of Official Analytical Chemists*** **56** (4) 869-875 (1973) [13 ref. En] [FDA, 850 Third Ave., Brooklyn, New York 11232, USA]

A method for the determination of Pb extracted from glazed ceramic surfaces (e.g. eating, cooking, drinking and measuring vessels) was adapted from the German standard procedure and extended to include extractable Cd. Studies comparing a 0.5 h exposure to 4% acetic acid at room temp. (22 ± 2°C) with a 24 h exposure under the same conditions indicated that the longer exposure gave higher, asymptotic values for extracted metal. In the collaborative study, 7 samples of the 24 h leach solution containing Pb, one of these also containing Cd, were sent to 13 collaborators for analysis by atomic absorption. The results show that the method is precise and accurate. The average relative SD for Pb was 5.2%, and for Cd, 3.9%, with average recoveries of 101% for both metals. The method has been adopted as official first action.
AS

11 H 1776

**A rapid method for the determination of lead in fruit juice and other beverages.**

Snodin, D. J.

***Journal of the Association of Public Analysts*** **11** (2) 47-51 (1973) [23 ref. En] [Sci. Advier's Dept., City & County of Bristol, BS8 2PR, UK]

A method for extraction, concentration and atomic absorption spectrophotometric determination of Pb in fruit juices and other soft drinks is described. 10 ml samples are mixed with 0.50 ml of conc. HCl + 1.0 ml of 10% ascorbic acid solution: 1.0 ml of 1% solution of diethylammonium diethyldithiocarbamate solution in xylene is then added. Similar samples (for use as blanks and standards) are prepared with water, water + 0.5 ppm Pb and juice + 0.5 ppm Pb. After centrifugation of the sample for 5 min at 3000 rev/min, the xylene layer is aspirated into the atomic absorption spectrophotometer. Recovery was generally almost linear, but dropped to 65% with highly sweetened beverages, the detection limit was approx. 0.02 ppm Pb. Addition of 65 ppm $Fe^{3+}$ did not interfere. Details are given of the Pb concn. of 22 beverage samples analysed. AJDW

11 J 1826

**Toxic heavy metals in vegetables and forage grasses in Missouri's lead belt.**

Hemphill, D. D.; Marienfeld, C. J.; Reddy, R. S.; Heidlage, W. D.; Pierce, J. O.

***Journal of the Association of Official Analytical Chemists*** **56** (4) 994-998 (1973) [12 ref. En] [Environmental Health Surveillance Center, Univ. of Missouri, Columbia, 65201, USA]

Missouri supplies approximately 75% of the US production of lead. Lead poisoning of horses in the vicinity of one smelter alarmed local residents about the possible hazards of consuming their fruits and vegetables. County Extension Directors selected cooperators in 7 counties in the lead mining and smelting area and 3 "control" countries in north Missouri to grow lettuce, radishes, and greenbeans for toxic metal analysis. Seed and cultural instructions were furnished all cooperators. All samples were washed in distilled water. Atomic absorption analyses detected the following maximum levels of Pb in µg/g dry weight: lettuce leaf 1324, radish root 518, and greenbean pods 136. Cd levels in µg/g dry weight were as follows: lettuce leaf 34.5, radish root 13.7, and greenbean pods 8.5. Vegetables from control counties contained markedly lower levels of Pb and Cd. AS

11 L 830

**[Lead contents of confectionery.]**

Yartseva, M. G.

***Gigiena i Sanitariya*** No. 8, 90-91 (1973) [Ru]

Mean values with SEM for Pb contents determined by spectral emission analysis in various confectioneries were (mg/kg, numbers of samples in parentheses): chocolate (163) 0.38 ± 0.031; chocolate assortments (187) 0.76 ± 0.064; chocolate sweets (286) 0.62 ± 0.053; cherries, plums, Canadian plums and almonds in chocolate (62) 0.55 ± 0.047; caramels (198) 0.10 ± 0.008; cream toffee and fondant (85) 0.92 ± 0.079; 'Korovka' (50) 0.04 ± 0.003; pastils, 'Zephyrs' (78) 0.12 ± 0.01; fruit jellies (73) 0.17 ± 0.014; fudge (30) 0.14 ± 0.012; 'Southern tablets', 'Kholodok' (45) 0.17 ± 0.015; khalva (25) 0.32 ± 0.027; and cranberries in icing sugar (10) 0.07 ± 0.006. SKK

11 N 606

**[Ultraviolet spectra of heated fats. XII. Effects of nickel and lead compounds on changes in sunflower oil during refining.]** Studium der UV-Spektren erhitzter Fette. XII. Einfluss von Nickel- und Bleiverbindungen auf Veränderungen des Sonnenblumenöls beim Erhitzen.

Sedlacek, B. A. J.

***Nahrung*** **17** (2) 185-197 (1973) [4 ref. De, en, ru] [Med. Forschungsklinik des Inst. für klinische und experimentelle Med., Prague, Czechoslovakia]

The effects of 1-200 ppm of added Ni$^{2+}$ (as nickel sulphate) or Pb$^{2+}$ (as lead acetate) on the changes in refined sunflower oil during heating for 35 h at 200°C were investigated. The extinction value and concn. of oxidation products in the oil reached a max. at 10 ppm added Ni$^{2+}$, then declined irregularly; the degree of polymerization was max. at 200 ppm added Ni$^{2+}$. The effect of Pb$^{2+}$ on the concn. of oxidation products closely resembled that of Ni$^{2+}$. Formation of thermal polymerization products was max. at 20 ppm added Pb$^{2+}$, and the concn. of oxypolymers was max. at 50 ppm added Pb$^{2+}$. The concn. of degradation products with free carboxyl groups and the intensity of browning of the oil were influenced to a greater extent by Pb$^{2+}$ than by Ni$^{2+}$. [See FSTA (1973) 5 6N267 for part XI.] IN

11 P 1600

**Determination of lead and cadmium in tapwater, rainwater, milk and urine.**

Holroyd, P. M.; Snodin, D. J.

***Journal of the Association of Public Analysts*** **10** (4) 110-113 (1972) [6 ref. En] [Sci. Adviser's Dept., Canynge Hall, Whatley Road, Bristol, UK]

Procedures for the routine atomic-absorption determination (air-acetylene flame) of environmentally and clinically significant levels of Pb and Cd are described. The rapid concentration technique used is a simplification of that of Willis [Analytical Chemistry (1962) **34**, 614] with ammonium pyrrolidine-1-carbodithioate as reagent. The metal-reagent complex is extracted into heptan-2-one, and the organic solution is aspirated into the instrument. The detection limits are 5 /kg for Pb and 1 µg/kg for Cd. [From Analytical Abstracts **25** , 515.] AS

11 P 1694

**Lead pollution: lead content in milk from cows fed on contaminated forages.**

Sapetti, C.; Ardunino, E.; Durio, P.

***Folia Veterinaria Latina*** **3** (1) 74-86 (1973) [16 ref. En, it, fr, es, de] [Istituto di Chimica Agraria, Univ. di Torino, Italy]

2 lactating cows were fed 1 g Pb/day in their hay for 10 days. Pb concn. in milk increased during the 1st 3 days of administration to reach approx. 0.03 ppm, and fell to normal levels 9 days after cessation of Pb administration. The cows were then fed 5 g Pb/day for 4 days. Pb concn. never exceeded 0.05 ppm in milk from 1 cow but reached a concn. of 0.2 ppm in milk from the other cow; blood and urine Pb concn. were higher in the latter cow indicating differences in Pb assimilation between the 2 cows. 8 days after cessation of Pb administration, Pb concn. in milk had fallen considerably, but not to control levels. SPT

12 A 536

**Determination of heavy metals in foods.**

Baetz, R. A.; Kenner, C. T.

***Journal of Agricultural and Food Chemistry*** **21** (3) 436-440 (1973) [14 ref. En] [Dept. of Chem., S. Methodist Univ., Dallas, Texas 75275, USA]

The proposed method utilized a $V_2O_5$-catalysed $HNO_3/H_2/H_2O_2$ digestion followed by pH adjustment to 7.0 ± 0.5. If a precipitate formed, it was filtered and analysed separately after being dissolved in acid. Heavy metals were removed from the digest with a column of Chelex 100 chelating ion-exchange resin in the sodium form. The metals were eluted from the column with 1N $H_2SO_4$ and were determined by atomic absorption. Sensitivity varied from 20 parts/billion for Zn to 0.20 ppm for Pb, and recoveries of added standards varied from 91.4% for Pb to 100.5% for Zn, with an overall average recovery of 95.2% and an average SD of 3.03%. The heavy metal content of 8 different types of foodstuffs has been determined. The proposed method can be used to determine Pb, Cd, Cu, Co, Mn, Ni, and Zn in biological materials in the ppm and parts/billion range on a single sample. AS

12 H 1892
**[Determination of the lead content of commercial fruit juices by means of inverse polarography.]** Bestimmung des Bleigehaltes von Fruchtsäften des Handels mit Hilfe der Inverspolarographie.
Bielig, H. J.; Mixa, A.
***Flüssiges Obst*** **40** (6) 226-227 (1973) [9 ref. De] [Inst. für Frucht- & Gemüsetech., Fachbereich Lebensmitteltech. & Biotech., Tech. Univ., Berlin (West)]

Samples of commercial fruit juices were obtained in summer 1972 in Berlin retail shops and their Pb contents were determined by inverse polarography (procedure decribed in detail). Pb contents of 18 orange juices ranged from 0.014 to 0.095 ppm (mean, 0.073 ppm); 2 dietetic orange juices had contents of 0.36 and 0.28 ppm; and for 8 apple juices, the range was 0.015-0.090 ppm (mean, 0.040 ppm). The Pb contents of all the juices tested were below the official max. of 0.5 ppm. [See also FSTA **5** (1973) 7J893.] SKK

12 J 1966
**[Lead, iron, zinc, cadmium and tin content of preserved foods.]** Blei-, Eisen-, Zink-, Cadmium- und Zinngehalt konservierter Lebensmittel.
Blumenthal, A.; Trottman, K.
***Alimenta*** **12** (4) 141-144 (1973) [7 ref. De, en, fr] [Zentral Lab. des Migros-Genossenschafts-Bundes, Zurich, Switzerland]

Fruit and vegetables packaged in (i) jars, (ii) lacquered cans and (iii) unlacquered cans were analysed for heavy metals by atomic absorption spectroscopy. General trends were as follows: Fe - no significant difference between (i) and (ii) (range 1.5-4.6 ppm), concn. in (iii) increased markedly during storage (e.g. globe artichokes contained 5 ppm after 3 months and 157 ppm after 40 months); Zn - higher concn. in (iii) than in (i) (range 0.4-7.3 ppm) with no increase during storage; Cd - not detected; Sn - insignificant concn. (<10 ppm) in (i) and (ii), appreciable concn. in (iii), increasing during storage (e.g. globe artichokes contained 50 ppm after 3 months and 305 ppm after 40 months, asparagus contained >250 ppm after 3 months); Pb - higher concn. in (ii) and (iii) than in (i), no increase during storage (range 0.02-0.15 ppm in (i), exceptionally 3.7 ppm in lemon juice; 0.16-0.78 in cans, exceptionally 1.7 ppm in lemon juice). RM

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H. BROOKES

ASSISTANT EDITOR

### 1

**[Improved polarographic method for determination of lead, copper and zinc in foods.]**
Sivkov, I. G.
***Voprosy Pitaniya*** No. 5, 75-76 (1973) [4 ref. Ru] [Permskii Pedagogicheskii Inst., Perm, USSR]

Polarography of product ash in 30% $CaCl_2$ is recommended for determination of Pb, Cu and Zn in foods and beverages, and it is suggested that, after further trials, the method might be incorporated into a Soviet Standard alongside the method using ammonium/ammonia solution, prescribed in **GOST 5370-58**. SKK

### 2

**Heavy metal contamination in home-produced beers and spirits.**
Reilly, C.
***Ecology of Food and Nutrition*** **2** (1) 43-47 (1973) [18 ref. En] [Dept. of Biochem., Univ., Lusaka, Zambia]

More than 130 beers and spirits from different parts of Africa, India, Europe and Canada were analysed for heavy metal contaminants. Max. amounts of Cu, Zn, Fe and Pb in 10 single samples of home-produced Zambian beers and spirits were 12.2, 22.7, 245.0 and 0.5 mg/l. vs. 0.4, 7.5, 2.5 and 0 in commercial samples. A high proportion of 120 home-produced (usually illicit) alcoholic drinks were found to contain Zn (0.10-68.0), Fe (0.20-245.0) and Cu (0.10-58.0 mg/l.). Little Pb was found. The metals were traced largely to the galvanized metal drums which have largely replaced traditional clay and wooden vessels. Analysis of distillates showed that Zn may be transferred from beer into the spirit and a second distillation may not result in a Zn-free product: a maize beer made in a metal drum contained 10.5 mg Zn/l., first distillate from a village still 0.8 mg and second distillate 0.6 mg. RM

### 3

**[Square-wave polarographic determination of arsenic and lead in rind of fruits.]**
Hagiwara, K.
***Japan Analyst [Bunseki Kagaku]*** **19** (4) 563-565 (1970) [5 ref. Ja, en] [Govt. Ind. Res. Inst., Osaka, Midorigaoka Ikeda-shi, Osaka-fu]

It has been found that As is extracted quantitatively into benzene from a comparatively high concn. of $H_2SO_4$ solution (9M) containing small amounts of chloride (0.5M) while Pb remains in the aqueous phase. As in the organic phase is back-extracted into water and determined by square-wave polarography using 2M HCl as a supporting electrolyte. Pb remaining in the aqueous phase is determined directly by square-wave polarography. The sample is decomposed with a mixture of 10 ml $H_2SO_4$ and 30-40 ml of $HNO_3$ in a Kjeldahl flask by heating. The solution after decomposition is transferred to a 100 ml beaker and 0.2 g hydrazine sulphate is added. It is heated again and the heating continued for about 10 min to reduce the As. The solution is transferred to a separating funnel and 10 ml of water containing about 0.5 g $NH_4Cl$ is added. As is extracted twice into 10 ml and 5 ml of benzene and determined after back-extraction into water as described above. Pb in the aqueous phase is also determined directly after the solution is transferred to a 20 ml volumetric flask. As (0.3-7 ppm) and Pb (1-20 ppm) in rinds of apples were determined by the method. AS

### 4

**[Copper, lead and tin in stored canned fish. I. Canned marine fish.]**
Stanculescu, C.; Marin, E.; Sandulescu, C.; Ille, C.; Trica, A.; Petrovici, C.; Popescu, P.
***Lucrari de Cercetare*** **9**, 213-224 (1972) [9 ref. Ro, en, fr, de, ru]

Contents of Cu, Pb and Sn were determined in 85 samples of various types of fish stored for 1 yr in lacquered cans. Values found were generally rather lower than some reports in the literature; mean figures and ranges of variation are tabulated in detail. Cu contents ranged from 0 to 2.25 mg/kg, Pb from 0 to 1.8 mg/kg and Sn from 0 to 40 mg/kg. However, Pb was absent from half the batches and only 13% of the remainder exceeded 0.5 mg/kg. Limits suggested for legal purposes are: Cu, max. 3 mg/kg for products in oil and 5 mg/kg in tomato sauce; Pb, normal max. 0.75 mg/kg, at the most 1.0 mg/kg; Sn, normal max. 50 mg/kg and at the most 100 mg/kg; all cans for marine products should be lacquered to prevent high Sn contents due to corrosion of metal containers. ELC

### 5

**[Copper, lead and tin in stored canned fish. II. Canned freshwater fish.]**
Stanculescu, C.; Marin, E.; Sandulescu, C.; Ille, C.; Trica, A.; Iliescu, M.; Petrovici, C.; Popescu, P.
***Lucrari de Cercetare*** **10**, 295-309 (1972) [8 ref. Ro, en, fr, de, ru]

The max., min., and mean values of Cu, Pb, Sn and As contents of various canned freshwater fish products were determined after storage for 1 yr. The initial As content was also determined. Metallic contamination was generally similar to levels found in marine fish except for rather lower levels of As. Cu ranged from 0 to 2.55 mg/kg. Pb ranged from 0 to 1.53 mg/kg, but this included over 1/3 of batches almost free from Pb, 1/2 of batches containing only small amounts (<0.5 mg/kg) and a few batches containing 0.5-1.0 mg/kg. In lacquered cans the Sn content was <50 mg/kg; in non-lacquered cans the amount increased to about 200 mg/kg after 1 yr. As contents were low; max. levels reached were 1.0 mg/kg in canned Danube herring and 0.5 mg/kg in fish products in tomato sauce. [See preceding abstr. for part I.] [From En summ.] ELC

## 6

**Evaluation of mercury, lead, cadmium and the food additives amaranth, diethylpyrocarbonate, and octyl gallate. Sixteenth report of the Joint FAO/WHO Expert Committee on food additives.**
Food & Agriculture Organization
***FAO Nutrition Meetings Report Series* 51A**, 84pp. (1973) [many ref. En] [Rome, Italy]
See FSTA (1973) **5** 8T388.

## 7

**Occurrence of lead in sesame paste and factors responsible for it.**
Yannai, S.; Haas, A.
***Cereal Chemistry* 50** (5) 613-616 (1973) [11 ref. En] [Dept. of Food Eng. and Biotech., Technion-Israel Inst. of Tech., Haifa]

Sesame paste was found to contain a relatively high concn. of Pb (approx. 2.2 ppm). Since storage in unlacquered cans, including an additional short-term test at 35°C, did not results in an increase over the initial level (found in paste from the same batch stored in polyethylene jars), the conclusion is that the above high figure is due not to migration of the metal present in the packaging material, but rather to an original high content in the oilseeds, as found in samples from 3 countries. AS

## 8

**[Studies of lead content on grapes and in must and wine.]** Untersuchungen über den Bleigehalt auf Trauben, im Most und Wein.
Enkelmann, R.; Bayerlander, C.
***Wein-Wissenschaft* 28** (6) 322-327 (1973) [6 ref. De] [St. Weinbauinst., Freiburg im Breisgau, Federal Republic of Germany]

Grapes were gathered in 3-kg batches from vines situated at distances of 2, 10 or 500 m from a road in Freiburg with daily traffic of 12 000 cars. The grapes were stemmed, crushed, and pulp was pressed 1-2 h later. Pb was determined polarographically in pomace, must, young wine, blue-fined wine and (for grapes nearest to the road only) in 5% $HNO_3$ washings from grape surface. Values for Pb contents of the products named were in that order (ppm): 2-m distance 1-h holding, 1.87, 0.22, 0.20 and 1.10; 10-m distance, 1-h holding 1.27, 0.153, 0.15 and 0.09, 2-h holding 1.02, 0.22, not stated and not stated; and 500-m distance, 2-h holding 0.45, 0.12, 0.11 and 0.06. Corresponding, calculated values for grape surface were: 0.505 (0.54 determined), 0.366, 0.374 and 0.176. SKK

## 9

**Determination of lead in evaporated milk by atomic absorption spectrophotometry and anodic stripping voltammetry: collaborative study.**
Fiorino, J. A.; Moffitt, R. A.; Woodson, A. L.; Gajan, R. J.; Huskey, G. E.; Scholz, R. G.
***Journal of the Association of Official Analytical Chemists* 56** (5) 1246-1251 (1973) [2 ref. En] [Div. of Chem. and Physics, FDA, Washington, DC 20204, USA]

Determination of Pb in evaporated milk was tested collaboratively by 11 laboratories. 5 laboratories used both atomic absorption spectrophotometry (AAS) and anodic stripping voltammetry (ASV) for the determination, 5 used only the atomic absorption method, and 1 used only the polarographic method. Each collaborator received 12 samples, 2 at each of the 5 different levels (0.06-0.95 ppm) and 2 practice samples with a known Pb content. Both AAS and ASV were equally suitable for the determination of Pb in the concn. range studied. The pooled variation between duplicate determinations was 0.0010 and 0.0016 ppm for the AAS and ASV methods, respectively. For the AAS determinations the coeff. of variation (random error components) decreased from 43% at the lowest Pb level to 4% at the highest level. Although the ASV results did not show the same regularity of decreasing coeff. of variation with increasing Pb level, the coeff. of variation were acceptable: 28% at the 0.06 ppm level and 6% at the 0.22 ppm level. The AAS method has been adopted as official first action and the ASV methods as interim official first action. AS

## 10

**Lead content of milks fed to infants - 1971-1972.**
Lamm, S.; Cole, B.; Glynn, K.; Ullmann, W.
***New England Journal of Medicine* 289** (11) 574-575 (1973) [25 ref. En] [Univ. of California - IIR, 2120 Channing Way, Berkeley, 92120, USA]

Mean concn. of Pb (μg/ml), determined by absorption spectrophotometry, were as follows (number of samples in parentheses): in evaporated skim-milk (9), 1.04; in infant-formula concentrate (9), 0.50; in evaporated milk (4), 0.36; in dried skim-milk (6), 0.86 [in μg/g]; in homogenized cows' milk (20), 0.04; and in human milk (14), 0.02. Calculations of Pb intake by infants, on the basis that the milks were prepared as directed on the label, indicated that evaporated skim-milk, infant formula concentrate and evaporated milk, would deliver respectively 0.52, 0.25 and 0.18 μg Pb/ml to infants, while dried skim-, homogenized cows' and human milk respectively would deliver only 0.09 μg/g, 0.04 and 0.02 μg/ml. DMK

## 11

**Continuous buttermaking.**
Mann, E. J.
***Dairy Industries*** **38** (11) 520-521 (1973) [18 ref. En] [Commonwealth Bureau of Dairy Sci. & Tech., Shinfield, Reading, Berks., UK]

## 12

3 C 87

**[Investigation of harmful trace elements in food.]**
Ko, I. S.; Ro, C. B.; Song, C.; Kwon, H. H.; Kim, K. S.; Chung, K. H.; Joo, C. B.
***Report of the National Institute of Health*** **9**, 389-406 (1972) [38 ref. Ko, en] [Dept. of Hygiene, Nat. Inst. of Health, Seoul, S. Korea]

Toxic trace elements were determined in foods commonly eaten in Korea; ranges of values determined were (ppm): Cu 0.01-7.60; Pb <0.01-0.83; Cd 0; Hg <0.01-0.09; As <0.01-0.13; Mn 0.01-11.5; and Zn <0.01-61.2. KoSFoST

## 13

**[Contamination of cereals and their products.]**
Kontamination von Getreide und Getreideerzeugnissen.
Hertel, W.
***Qualitas Plantarum - Plant Foods for Human Nutrition*** **23** (1/2/3) 269-279 (1973) [13 ref. De, en] [Seestrasse 11, 1000 Berlin 65, Germany]

Environmental contamination of cereals and cereal products in the field, during storage or during manufacture is discussed under the following headings: insecticide and fungicide residues on harvested products and in storage silos; gaseous products of combustion e.g. from industrial surroundings, automobiles on roads or direct drying gases; and fall-out of radioactive elements. Other possibilities are residues of plant growth regulators, mycotoxins and various additives used during milling and baking. Experiments are reported on the distribution of lindane in milling fractions, dough and bread from wheat containing known additions. About 25-50% of the lindane remained in various flours, but was considerably increased relatively in bran and germ. Lindane residues remained highly persistent (93-99%) throughout the dough and breadmaking processes. Data are given on the distribution of lindane and malathion in oat milling fractions, on falling levels during storage and reduction obtained by washing or steam treatments (70%). Other examples include contamination by combustion gases, with special reference to 3,4-benzpyrene, and by trace of Pb which showed marked reduction as distance of cultivation from a road increased from 10 to 200 m. ELC

## 14

**[Studies on the contents of mercury, cadmium, lead, and copper in edible seaweeds in Korea.]**
Kim, C. Y.
***Bulletin of the Korean Fisheries Society*** **5** (3) 88-96 (1972) [9 ref. Ko, en] [Pusan Fisheries Coll., S. Korea]

17 species of edible seaweeds were examined for their heavy meatl content. Concn. in air-dried seaweeds were as follows: Hg 0.02-0.52 ppm, Cd 0.02-1.48 ppm, Pb 0.20-1.31 ppm, and Cu 0.90-17.0 ppm. KoSFoST

## 15

**[Determination of some biocides in veal.]** Die Bestimmung einiger Biozide in Kalbfleisch.
Attig, D.; Eichner, K.; Heffter, A.; Oberdieck, R.; Vöcks, R.; Walther, G.
***Schlacht- und Viehhof-Zeitung*** **73** (7) 253-256, 263-265 (1973) [17 ref. De, fr] [Chem. Landesuntersuchungsanstalt, Karlsruhe, Federal Republic of Germany]

Samples of muscle, liver and kidney tissue from 18 calves were analysed for Hg, Pb and Cu (by atomic absorption spectrophotometry), As (by spectrophotometry), chlorinated hydrocarbons and polychlorinated biphenyls (by GLC) and diethylstilboestrol. The analytical procedures used are discussed in detail, and results are discussed in relation to tolerances. AJDW

## 16

**Cadmium, lead and mercury content of various cured meats.**
Kirkpatrick, D. C.; Coffin, D. E.
***Journal of the Science of Food and Agriculture*** **24** (12) 1595-1598 (1973) [29 ref. En] [Food Res. Lab., Health Protection Branch, Dept. of Nat. Health and Welfare, Ottawa, Ontario, Canada]

Results are presented for the levels of Cd, Pb and Hg in 190 cured meat samples. The Cd content was in the range <0.01-0.22 ppm, the mean being 0.02 ppm; the range and mean of the Pb content were <0.01-0.42 and 0.06 ppm; the range and mean of the Hg content were <0.001-0.059 and 0.006 ppm. AS

## 17

**[Residues in meat: pesticides and heavy metals.]** Rückstände in Fleisch. Pestizide und Schwermetalle.
Mirna, A.; Hecht, H.
*Fleischwirtschaft* 53 (9) 1212, 1214-1216 (1973) [De] [Bundesanstalt für Fleischforschung, 8650 Kulmbach, Federal Republic of Germany]

Possibilities for reducing pesticide residues discussed include reducing use of fatty tissues in meat products, and decomposing pesticides to compounds not stored in human tissue, e.g. decomposing DDT to DDD by fermentation with micrococci: during 38 days storage, DDT concn. of fermented sausages was reduced to 30%. Concn. of As, Br, Cd, Cr, Hg, Sb, Se, Sn and Pb found in pork, beef and veal are tabulated, showing species-specific differences. Results are discussed with reference to permitted tolerance levels. RM

## 18

**A study on the test of lead chromate in turmeric.**
Pramanik, N. K.
***Journal of the Institution of Chemists (India)* 45** (1) 3-5 (1973) [7 ref. En] [W. Bengal Public Health Lab., Calcutta]

Samples of turmeric giving a negative test for lead chromate, may still contain considerable quantities of trivalent Cr (4-50 mg/kg) and Pb (64-700 mg/kg), because the lead chromate test is specific to tetravalent Cr. It is suggested that the standards concerning adulteration and testing of turmeric should be re-examined. WHCA

## 19

**Separation, identification and quantitative estimation of non-nutritive toxic elements, lead, copper and arsenic in food by thin layer chromatography.**
Mukherjee, D.; Saha, A.; Mathew, T. V.
***Research and Industry, India*** 17 (4) 150-151 (1972) [10 ref. En] [Central Food Lab., Calcutta 16, India]

A method for the separation and quantitative estimation of 3 trace metals, Pb, Cu and As, in foods, by TLC using cellulose as absorbent is described. Solvents found to give the best separation were: ethanol:5N HCl (9:1) and chloroform:isoamyl alcohol:conc. HCl (10:10:1). The developing time for each solvent was 1 h. After drying, the plates were sprayed with 0.05% solution of dithizone in carbon tetrachloride, a black spot denoted Cu and a yellow spot As. The plates were then sprayed with 25% ammonia solution and a red spot indicated Pb. The limit of detection of the method is 2 µg. AA

## 20

**[Lead contents of foodstuffs. II. Lead contents of fruit juices, soft drinks and mineral waters.]** Blei-Gehalte von Lebensmitteln. II. Blei-Gehalte von Fruchtsäften, Erfrischungsgetränken und Mineralwässern.
Boppel, B.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 153 (6) 345-347 (1973) [7 ref. De, en] [Inst. für Strahlentech., Bundesforschungsanstalt für Lebensmittelfrischhaltung, Karlsruhe, Federal Republic of Germany]

The Pb contents of 119 samples of fruit juices, soft drinks and mineral waters from several manufacturers were determined. All samples were dry ashed; after chemical separation the Pb content was measured in an /atomic absorption spectrometer. In most grape juices >100 µg Pb/l. was found, the highest value being 224 µg. The other fruit juices and soft drinks contained <100 µg Pb/l. In mineral waters the Pb content were below the detection limit of 4 µg Pb/l. AS

## 21

**[Health risks resulting from the persistence of certain substances in water.]**
Hernberg, S.
*Brasserie Malterie Europe* 23 (12) 285-286 (1973) [Fr] [Inst. de la Med. du Travail, Helsinki, Finland]

A study group, meeting in Helsinki in April 1972, recommended that the max. permitted levels of metals in drinking water should be (as mg/l.): As, 0.05; Cd, 0.005; Pb, 0.05; Mn, 0.5; and Hg, 0.001. Further studies on the ditribution, metabolism and toxicity of metals, and on the standardization of analytical methods were recommended. MEG

## 22

**[Tin and lead contamination of commercial orange juices packed in cans.]**
Royo Iranzo, J.; Grima, R.
***Revista de Agroquimica y Tecnologia de Alimentos*** 13 (3) 436-442 (1973) [3 ref. Es, de, en, fr] [Inst. de Agroquimica y Tecnologia de Alimentos, Valencia, Spain]

40 samples of commercial canned orange juice from various countries were examined. The following data are tabulated for each sample: type of tinplate, height of head-space, vacuum, °Brix, acidity, maturity index, contents of nitrate, Sn and Pb, and corrosion of can. Amounts of Sn found were very variable, range 5-332 ppm, 16 samples containing >150 ppm, and 5 samples >250 ppm. High Sn values corresponded generally to high head-space and nitrate content and low vacuum, but there was no constant correlation, suggesting that other factors may be involved. Pb ranged from 0.07 to 0.53 ppm, with 17 samples containing >0.3 ppm and 2 >0.5 ppm. RM

### 23

**[Heavy metal contamination of foods. I. Cocoa beans.]** Schwermetallkontamination von Lebensmitteln. I. Kakaobohnen.
Musche, R.; Lucas, W.
***Deutsche Lebensmittel-Rundschau*** **69** (8) 277-278 (1973) [1 ref. De, en, fr]

Cocoa beans from various countries were incinerated and tested for Pb content by the method of Oelschläger & Schwarz [FSTA (1972)**4** 7S926]. The results showed that beans from Central and South America contained 0.19-0.25 ppm Pb, compared with 0.14-0.35 ppm for samples from Africa. Increased incidence of damage led to higher Pb contents in the beans. KSB

### 24

**[Heavy metal contamination of foods. II. Studies on the lead content of cocoa products.]** Schwermetallkontamination von Lebensmitteln. II. Untersuchungen über die Bleigehalte in Kakoa-Halb- und -Fertigprodukten.
Lucas, W.; Musche, R.
***Deutsche Lebensmittel-Rundschau*** **69** (12) 460-461 (1973) [3 ref. De, en, fr]

Pb concn. were determined by the dithizone method in samples of cocoa nib, cocoa mass, chocolate mass, chocolate, cocoa butter and cocoa powder. Approx. mean Pb concn. found were as follows (ppm): cocoa powder 0.2; cocoa butter 0.1; chocolate 0.1-0.2. Relatively high Pb concn. in 1 sample of cocoa butter (1.0 ppm) and 1 sample of heavily-defatted cocoa powder (0.5 ppm) were attributed to contact with lead-containing solder and a washer made from material of high lead content. AJDW

### 25

**[EDTA method for determination of lead in lead acetate reagents and compounds used for their preparation.]**
Reno, G.
***Sucrerie Belge*** **92** (9) 331-336 (1973) [7 ref. Fr, de, en, nl] [Raffinerie Tirlemontoise, Belgium]

An EDTA titration method for determining Pb in lead acetate reagents and precursors is described. It can be used with dilute solutions containing $Ca^{2+}$ and $Mg^{2+}$ ions (e.g. from hard water used for diluting the reagent) as Ca and Mg do not interfere. Because a large proportion (approx. 36.5%) of Pb is precipitated when the best defaecating reagent (Courtonne reagent) is diluted with very hard water, dilution with fairly soft water is recommended. RM

### 26

**[Lead contents of foods. I. Determination of lead in foods.]** Bleigehalte von Lebensmitteln. I. Zur Analytik der Bleibestimmung in Lebensmitteln.
Boppel, B.
***Zeitschrift für Analytische Chemie*** **268** (2) 114-119 (1974) [13 ref. De, en] [Inst. für Strahlentech., Bundesforschungsanstalt für Lebensmittelfrischhaltung, D-7500 Karlsruhe, Engesserstrasse 20, Federal Republic of Germany]

A method is described which minimizes errors in Pb determination in foods. Loss of Pb during dry ashing was shown to increase with sample temp. Ashing data from one type of food (e.g. vegetable) cannot be directly applied to another (e.g. meat) but must be determined experimentally for each type. Many matrix elements in ash solutions affect Pb determination by atomic absorption spectroscopy (AAS). By $H_2S$ coprecipitation of Pb and added Ag ions as $PbS$-$Ag_2S$ this disturbance is avoided and the Pb concn. increased. A nitrate-carbonate melt before $H_2S$ coprecipitation removes residual C of the ash and frees acid-insoluble compounds, thus eliminating need for HF decomposition of silicates. Pb content in final solution is determined by AAS by comparison with a standard solution. Accurate results were obtained for 20-1240 µg Pb/sample. Recovery was 97-101%. Excellent agreement was obtained with standard materials: orchard leaves, standard reference material 1571 (Nat. Bureau of Standards, Washington, DC) and standard kale, Chemistry Department, University of Reading, [UK]. [See also FSTA (1974) **6** 2A70.] RM

### 27

**[Determination of lead in vegetable and animal matter (including bovine liver, rabbit's liver, ovine muscle and rabbit's muscle), and in mineral feedstuffs by means of atomic absorption spectrophotometry (AAS).]** Bestimmung von Blei in pflanzlichen und tierischen Materialien, sowie in Mineralfuttermitteln mit Hilfe der Atomabsorptionsspektralphotometrie (AAS).
Oelschläger, W.; Frenkel, E.
***Landwirtschaftliche Forschung*** **26** (3) 281-292 (1973) [14 ref. De, en, fr] [Abteilung Tierernährung, Univ., Hohenheim, Federal Republic of Germany]

### 28

**[The importance of food research chemists in environmental protection.]** Die Bedeutung des Lebensmittelchemikers aus dem Forschungsbereich für den Umweltschutz.
Fresenius, W.
***Deutsche Lebensmittel-Rundschau*** **70** (1) 13-15 (1974) [14 ref. De] [Inst. Fresenius, Chem. & Biologische Lab. GmbH, 6200 Wiesbaden, Kapellenstrasse 11-15, Federal Republic of Germany]

Problems of the contamination of foods and water with aflatoxins, heavy metals, biocides, nitrosamines and polycyclic aromatic hydrocarbons are discussed, with special reference to sampling methods and analytical techniques. AJDW

### 29

**[Lead content of commercially prepared soups.]**
Bleigehalte von industriell hergestellten Fertigsuppen.
Boppel, B.; Diehl, J. F.
***Lebensmittel-Wissenschaft + Technologie*** **6** (6) 227-228 (1973) [1 ref. De] [Inst. für Strahlentech., Bundesforschungsanstalt für Lebensmittelfrischhaltung, D-7500 Karlsruhe, Engesserstrasse 20, Federal Republic of Germany]

Data on wt. of package contents and Pb content of duplicate samples (each representing several packages) of 20 varieties of commercial dried soups and soup cubes are tabulated. Pb contents of the duplicate samples ranged from 0.096 to 1.0 and from 0.095 to 1.84 μg/g respectively with an overall mean value of 0.31 μg/g. SKK

### 30

**[Removal of residual pesticides from vegetables. I. Removal of residual pesticides from komatsuna (Brassica chinensis L.) by washing.]**
Deura, H.
***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** **13** (1) 63-67 (1972) [10 ref. Ja, en] [Environmental Hygiene Lab., Lion Fat & Oil Co., Ltd., Hirai 3-chome, Edogawa-ku, Tokyo]

Removal of pesticide residues by washing with a detergent was studied using komatsuna (Chinese cabbage, Brassica chinensis L.) which had been sprayed with arsenate or BHC. Removal efficiency was calculated from the ratio of the sum of the pesticide residues found in the washing solution and in the rinsing water to the residues found in the unwashed vegetables. Almost a complete removal of As and Pb was achieved through detergent washing. Removal efficiency for BHC by detergent washing was about 2.5 × higher than that of water washing. Effect of rinsing following detergent washing was found to be significant. TM

### 31

**[Removal of residual pesticides from vegetables. II. Removal of residual pesticides from Shantung greens and other vegetables by washing.]**
Deura, H.
***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** **13** (1) 68-73 (1972) [5 ref. Ja, en]

Shantung greens sprayed with lead arsenate, sumithion and elsan, cucumber sprayed with sumithion, tomato sprayed with malathion, cabbage sprayed with dichlorvos were washed by dipping, shaking, brushing or rubbing with or without detergent. Pb and As were removed more efficiently and more completely by detergent washing. As for the organic pesticides, the detergent washing was found to be effective and further improved by washing with a vigorous mechanical process such as brushing or rubbing. [See preceding abstr.] TM

### 32

**[Lead in foods of vegetable origin.]**
Guthenberg, H.; Beckman, I.
***Var Föda*** **26** (1) 2-7 (1974) [9 ref. Sv] [The Central Lab. of Swedish Customs, S-103 10 Stockholm, Sweden]

The Pb content has been determined in fruit and vegetables (kale, raspberries, strawberries, gooseberries, cherries, potatoes, root-parsley, lettuce, mushrooms, wheat, redcurrants, blackcurrants and apples) growing along trunk roads. The level of Pb contamination was generally highest close to the road. The highest concn. observed was 1.8 mg/kg in marrow stem kale. Rinsing the samples diminished the Pb content in some cases. Data are tabulated. AS

### 33

**[Determination of PbO in basic lead acetate and basic lead acetate-based clarifying reagents.]**
Rens, G.
***Sucrerie Belge*** **93** (1) 9-13 (1974) [5 ref. Fr, de, en, nl] [Raffinerie Tirlemontoise, Belgium]

The method of PbO determination of the American Chem. Soc. [Ind. Eng. Chem., Anal. Ed. (1944) **16**, 282] recommended by ICUMSA was applied to solid basic lead acetate, 2 basic lead acetate preparations according to Horne, crystallized neutral lead acetate, pure PbO, various commercial clarifying agents and Courtoune's ammonia-lead acetate reagent. It is essential to determine the total Pb concn. to obtain the basicity of the reagents i.e. the fraction of Pb present as PbO/100 parts total Pb. Analyses of various reagents revealed differences in both total Pb concn. and basicity e.g. total Pb concn. found (g/l.) were German/Belgian reagent 220, ICUMSA 240, modified ICUMSA 260, Courtonne 190. To ensure uniform results, reagents should have the same total Pb concn. and the same basicity. This would be best achieved by preparing an official reagent from accurate quantities of neutral crystallized lead acetate ($Pb(CH_3COO)_2 \cdot 3H_2O$), pure PbO and $CO_2$-free distilled water. [See also FSTA (1974) **6** 3L223 & 4L231.] RM

### 34

**[Simultaneous determination of manganese, copper, lead and zinc in unpolished rice by atomic absorption spectrophotometry.]**
Ikebe, K.; Tanaka, Y.; Tanaka, R.; Kunita, N.
***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** **13** (3) 195-204

(1972) [13 ref. Ja, en] [Prefectural Inst. of Public Health, Nakamichi 1-chome, Higashinari-ku, Osaka]

Accurate and rapid determination of Mn, Cu, Pb and Zn in unpolished rice was achieved by atomic absorption spectrophotometry. Metals in the samples were extracted by nitric acid for analysis after ashing by a low temp. asher using $O_2$ plasma. The mean recovery rates in 10 experiments for Mn, Cu, Pb and Zn were 99%, 100%, 98% and 101%, respectively. **TM**

### 35

**[Current questions in food legislation.]** Aktuelle Fragen des Lebensmittelrechts.
Eckert, D.
***Deutsche Lebensmittel-Rundschau*** **70 (1) 27-31** (1974) [De] [Bundesministerium für Jugend, Familie und Gesundheit, 53 Bonn-Bad Godesberg, Deutschherrenstrasse 87, Federal Republic of Germany]

Developments in legislation for foods in the Federal Republic of Germany are discussed, with special reference to low-calorie foods, nutritional labelling, wt. labelling, data marking, definitions, heavy metal and pesticide residues, and dietetic products. Developments in EEC legislation are also briefly discussed. AJDW

### 36

**[Application of inversion chronopotentiometry for determination of Zn, Pb and Cu in vegetable matter.]**
Karnankhov, A. I.; Grinevich, V. V.; Skobets, E. M.
***Agrokhimiya*** No. 8, 140-144 (1973) [Ru] [Ukrainskaya Sel'sko-khoz. Akad., Kiev, USSR]

### 37

**[Motor traffic-induced contamination with lead in the vicinity of roads.]** Über die verkehrsbedingte Bleikontamination längs Autostrassen.
Gyimothy, J.; Weiser, M.; Fellner, A.
***Wiener Tierärztliche Monatsschrift*** **60** (8/9) 259-266 (1973) [38 ref. De, en] [Inst. für Tierernährung. Milchhygiene und Lebensmittelkunde. Tierärztliche Hochschule. Vienna. Austria]

Pb contamination of plants growing near to roads was investigated in a series of studies. Pb was determined in 131 samples of plants growing at various distances from roads of various levels of traffic density. Mean Hg concn. in plants growing 1 m from motorways was 80 ppm; corresponding values for plants growing 10 and 50 m from the motorway were 62.5 and 25.0 ppm respectively. The results are discussed with reference to possible health hazards from edible crops grown in close proximity to roads. AJDW

### 38

**[Determination of lead in drinking water by inverse polarography.]**
Armeanu, V.; Hornar, S.
***Industria Alimentara*** **23** (9) 503-504, 511 (1972) [6 ref. Ro, en, fr, de, ru] [Acad. de Studii Economice, Bucharest, Rumania]

A method is described for determination of Pb traces in drinking water by inverse polarography by the suspended Hg drop method using a PO4 polarograph and Kemula (EPAM) electrode supplied by Radiometer (Copenhagen, Denmark) and isothermally purified hydrochloric acid. Values for water from different places in Bucharest are presented; all were below the official Pb tolerance limit. It is considered that use of the polarograph greatly simplified determination of Pb traces. SKK

### 39

**[Relation of trace elements present in some Adriatic fish species to industrial pollution.]**
Ciusa, W.; Giaccio, M.
***Bollettino dei Laboratori Chimici Provinciali*** **23** (2) 137-145 (1972) [7 ref. It, de, en, fr] [Istituto di Merceologia delle Univ. di Bologna e Pescara, Italy]

Systematic analyses were carried out on the Hg, Cu, Pb and Zn contents of the edible portion of 18 fish spp. obtained from fish markets or areas on the Adriatic coast most affected by pollution. Results suggested that trace element contents are related to the presence of industrial wastes. Max. levels found were (ppm fresh wt.): Hg 1.31, Cu 5.85, Pb 2.10, Zn 20.45. Accumulation of trace elements was especially marked in scampi and cuttlefish. In no case was it necessary to prohibit sale of fish from an area. RM

### 40

**[Evaluation of the meat of slaughter animals suffering from acute lead poisoning.]** Zur fleischbeschaulichen Beurteilung akut bleivergifteter Schlachttiere.
Kreuzer, W.; Kracke, W.; Sansoni, B.
***Schlacht- und Viehhof-Zeitung*** **73** (10) 369-378 (1973) [51 ref. De, fr] [Bereich für Hygiene und Tech. der Lebensmittel Tierischen Ursprungs, Univ., Munich, Federal Republic of Germany]

Studies conducted on 4 acutely Pb poisoned cows (3-5 yr old) and 8 mildly poisoned cows from the same herd are described. Poisoning was due to consumption of $Pb_3O_4$-contaminated feed. The 4 acutely poisoned animals were slaughtered, and the Pb concn. of various tissues were determined by flameless atomic absorption spectrophotometry; corresponding samples from 5 normal cattle were also analysed. Ranges of values for the Pb content of tissues of the 4 experimental animals were (ppm): muscle 0.04-0.18 (3 animals); brain 0.36-0.47 (2 animals); small intestine 1.6 (1 animal); spleen 1.7-3.0 (4 animals); liver 3.1-20.2 (4 animals); and kidneys 2.4-59.0 (4 animals).

Corresponding results for the control animals were: 0.13-0.35; not given; not given; 0.1-0.44; 0.1-1.4; and 0.26-1.7. There was no simple linear relationship between Pb concn. and the intensity of symptoms of Pb poisoning. The results are discussed with reference to legal aspects and control of the hygienic quality of meat. AJDW

## 41

**Lead contamination in milks fed to infants: 1972-1973.**
Lamm, S. H.; Rosen, J. F.
***Pediatrics, USA*** **53** (2) 137-141 (1974) [13 ref. En] [Albert Einstein Coll. Med., New York 10467, USA]

The lead content in cans, bottles and cartons of infant milk feeds, obtained from retail stores in New York during late 1972 and early 1973, was determined using a modification of the flameless atomic absorption spectrophotometric method (AAS), previously described for the measurement of Pb in whole blood [Journal of Laboratory and Clinical Medicine (1972) **80**, 567]. The mean Pb concn. found, in µg/100 ml ±SD, were as follows: evaporated skim-milk (11 samples), 6.0 ± 0.2; evaporated milk (15), 11.0 ± 1.1; conc. infant formula (6), 8.3 ± 0.9; 'ready to serve' infant formula (30), 3.3 ± 0.4; homogenized cows' milk (19), <0.50; 10 samples of human milk analysed also contained <0.50. Milk containers were not found to be a significant source of Pb contamination, but the results obtained suggested that Pb contamination was introduced at any one of several processing steps during manufacture. It is pointed out that these levels were markedly lower than those recorded during a survey of similar milks in 1971-1972 and it is proposed that currently applied standards for max. permissible levels of Pb in infants' milks are too high and should be reviewed. [See also FSTA (1974) **6** 2P251.] EJM

## 42

**[Comment on paper by Lamm & Rosen entitled 'Lead contamination in milks fed to infants: 1972-1973.']**
Sarett, H. P.
***Pediatrics, USA*** **53** (2) 143-144 (1974) [14 ref. En] [Infant Formula Council, 64 Perimeter Center East, Atlanta, Georgic 30346, USA]

In a critical comment on the surveys by Lamm et al. [see preceding abstr.] the author suggests that a comparison of the results between the 2 surveys is invalid since different methods of analysis were employed; furthermore, he asserts that the levels reported by Lamm et al. in their first survey were erroneously high and that the levels for cows' milk reported in the 2nd survey were too low. He backs his criticisms by relevant data from the literature. EJM

## 43

**[Further comment on paper entitled 'Lead contamination in milks fed to infants in 1972-1973.']**
Rosen, J. F.; Lamm, S. H.
***Pediatrics, USA*** **53** (2) 144-145 (1974) [12 ref. En]

Commenting on Sarett's criticism of their paper [see preceding abstr.] the authors defend their results with reference to the findings of other workers and produce evidence suggesting that the results obtained by the different analytical methods employed in the surveys were comparable. EJM

## 44

**[The changing environment: advantages and dangers in nutrition.]** Veränderte Umwelt: Gewinn und Gefahren für unsere Ernährung.
Aebi, H.
***Ernährungs-Umschau*** **20** (12) 471-477 (1973) [12 ref. De, en] [Med.-Chem. Inst., Univ., Bern, Switzerland]

This lecture presented at a meeting in Saarbrücken in Oct. 1973 in commemoration of the 20th anniversary of the German Nutrition Society deals mainly with trends in bread consumption, contamination of food with heavy metals, antibiotics, pesticides, hormones, biotoxins, plastics, and paint components at different stages of production, packaging and distribution, and with positive developments in food synthesis and application. SKK

## 45

**The toxic potential of trace metals in foods. A review**
Somers, E.
***Journal of Food Science*** **39** (2) 215-217 (1974) [13 ref. En] [Food Res. Lab., Dept. of Nat. Health & Welfare, Ottawa, Canada K1A OL2]

Foods contain trace amounts of a wide range of heavy metals; some of these have a biochemical function, others are contaminants. Trace metals can contaminate foods through agricultural technology, industrial pollution, geological sources and food processing. Some results from recent Canadian monitoring surveys are given with particular emphasis on data from Pb and Cd analyses. Consideration is given to the criteria that can be used to determine the priorities in the design of a monitoring programme for trace metals in foods. IFT

## 46

**[Harmful compounds in cereals - a problem of consumer protection.]** Schadstoffe in Getreide - ein Problem des Verbraucherschutzes. [Lecture]
Seibel, W.; Ocker, H. D.
***Mühle + Mischfuttertechnik*** **111** (11) 163-166

(1974) [11 ref. De] [Bundesforschungsanstalt für Getreideverarbeitung, Detmold, Federal Republic of Germany]

Max. permitted levels, origins, occurrence, effects of processing, and alternatives to using harmful compounds in cereals and cereal products are discussed. Harmful substances include radioactive compounds, heavy metals (e.g. As, Pb, Cd, Hg), carcinogenic hydrocarbons (e.g. benzpyrene), mycotoxins, and residues of pesticides and preservatives. While processing (hulling, milling) reduces levels in flour by 50-80%, it enriches by-products which may be used in animal feed. Alternative methods are recommended which would reduce the level of contamination e.g. using non-persistent pesticides instead of persistent ones. RM

## 47

**[Present-day knowledge on milk hygiene with particular reference to the problem of residues.]** Milchhygiene aus heutiger Sicht unter besonderer Berücksichtigung des Rückstandsproblems. [Review]

Kreuzer, W.

*Wiener Tierärztliche Monatsschrift* 61 (2) 57-66 (1974) [54 ref. De, en] [Bereich für Hygiene und Tech. der Lebensmittel tierischen Ursprungs, Tierärztliche Fak., Univ., Munich, Federal Republic of Germany]

Problems of milk hygiene, especially microbiological quality of milk and residues of various substances (antibiotics, disinfectants, mycotoxins, organochlorine pesticides, Pb, Cd, Hd, and radionuclides) in dairy products, are discussed in relation to animal health and milk handling and processing. It is pointed out that the present situation of residues in dairy products, although not constituting a hazard for healthy adults, has reached a critical stage as far as children and sick persons are concerned. ADL

## 48

**[Biocides and toxic trace substances in the food chain soil-plants-milk-man.]** Biozide und toxische Spurenstoffe in der Nahrungskette Boden-Pflanze-Milch-Mensch.

Tolle, A.; Heeschen, W.; Blüthgen, A.

*Fortschritte der Veterinärmedizin* No. 20, 197-206 (1974) [12 ref. De] [Inst. für Hygiene der Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

This paper, presented at the 10th Congress of the German Veterinary Society (12-14 April 1973, Bad Nauheim, Federal Republic of Germany) gives brief details of the origin, tolerance limits and trends in the concn. of contaminants (organochlorine insecticides, antibiotics, Pb, Hg and Cd) in milk in the Federal Republic of Germany. Studies conducted over the period 1969-1973 show that, during this period, the concn. of residues of DDT and its metabolites have decreased by 71%; corresponding values for heptachlor + heptachlor epoxide, aldrin + dieldrin and lindane were 66%, 78% and 38% respectively. The incidence of antibiotic residues in raw milk has decreased from 2.4% to 0.5%; no antibiotics were found in pasteurized milk in the retail trade. Concn. of heavy metals and Se in milk present no significant health hazard. [See also FSTA (1974) 6 7P1040.] AJDW

## 49

**Organic solvent extraction of lead and cadmium from aqueous solutions for atomic absorption spectrophotometric measurement.**

Childs, E. A.; Gaffke, J. N.

*Journal of the Association of Official Analytical Chemists* 57 (2) 360-364 (1974) [6 ref. En] [Seafoods Lab., Dept. of Food Sci. and Tech., Oregon St. Univ., 250 36th Street, Astoria, 97103, USA]

The efficiency of solvent extraction of Pb and Cd for atomic absorption spectrophotometry was investigated. Quantitative extraction from an aqueous solution into methyl isobutyl ketone was possible, using sodium diethyl dithiocarbamate in the pH range of 5.5-8.5 for Cd and 5.5-7.5 for Pb. A 4-fold concn. from aqueous or organic solvent allowed accurate measurement (error $<\pm 10\%$) of concn. <0.02 µg Pb/ml and <0.05 µg Cd/ml. Detection limits of 0.01 µg Pb/ml and 0.0005 µg Cd/ml were established. This method has been used successfully to measure the Pb and Cd content of fish muscle. AS

## 50

**[Anodic stripping voltametry for the determination of copper, lead and cadmium with subsequent colorimetric determination of iron in caseins.]** Invers-Polarographische Bestimmung von Kupfer, Blei und Cadmium sowie anschliessende kolorimetrische Eisenbestimmung aus einem Aufschluss in Caseinen.

Mrowetz, G.; Thomasow, J.

*Milchwissenschaft* 29 (2) 74-78 (1974) [4 ref. De, en] [Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

Cu, Pb and Cd contents of casein are determined by inverse polarography at 25°C of a diluted sulphuric/perchloric acid digest of 0.2 g casein. Fe is subsequently determined colorimetrically in the same diluted digest by addition of bathopenanthroline, extraction of the coloured complex with hexanol and measurement of its extinction at 533 nm. Limits of detection of Cu, Pb and Cd were 0.1 ppm and of Fe 1.0 ppm, corresponding recoveries of these metals when added were over 90% for the first 3 and about 97% for Fe. Commercial caseins examined (12) contained 0.9-4.9 ppm Cu, 0.1-2.1 ppm Pb, <0.1 ppm Cd and 3-33 ppm Fe. GTP

## 51

**Possible interference in the measurement of lead and cadmium from elements found in fish muscle.**

Childs, E. A.; Gaffke, J. N.

***Journal of the Association of Official Analytical Chemists*** 57 (2) 365-367 (1974) [2 ref. En] [Seafoods Lab., Dept. of Food Sci. and Tech., Oregon St. Univ., 250 36th Street, Astoria, 97103, USA]

The effects of various elements found in fish muscle on the measurement of Pb and Cd by atomic absorption spectrophotometry in either an aqueous or an organic solvent system were evaluated. Although a number of elements altered the measurement, the composite effect for both Cd and Pb in either solvent system was ± 10%. The extent of interference of all added elements was found to be a function of the amount of Pb or Cd present. AS

## 52

**[Contents of heavy metals in foods. I.]**

Tanaka, Y.; Ikebe, K.; Tanaka, R.; Kunita, N.

***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** 14 (2) 196-201 (1973) [11 ref. Ja] [Osaka Pref. Inst. of Public Health, 3-69 Nakamichi 1-chome, Higashinari-ku]

Seven kinds of heavy metals such as Cd, Zn, Mn, Cu, Pb, As and total-Hg were analysed in a number of agricultural and marine products and chicken eggs, and the results tabulated. TM

## 53

**[Use of polarography and oscillographic polarography in food analysis.]** Anwendung der Polarographie und der oszillographischen Polarographie mit Wechselstrom in der Lebensmittelanalyse.

Malkus, Z.

***Nahrung*** 18 (3) 323-328 (1974) [60 ref. De] [Inst. für Hygiene & Epidemiologie, Forschungstelle für Nahrungs- & Ernährungshygiene, Prague, Czechoslovakia]

Polarographic detn. of heavy metals, carbohydrates, carbonyl compounds, vitamins, amino acids, proteins, preservatives and additives and contaminants in foods is discussed, with reference to literature data. IN

## 54

**Toxic hazards associated with processed foods.**

Kingsford, M.

***Food Technology in New Zealand*** 8 (4) 13-15, 18-19; (5) 20-22 (1973) [67 ref. En] [Dept. of Sci. & Ind. Res., Chem. Div., Petone]

Toxic hazards associated with raw materials, preparation, additives, processing, packaging, storage and transport in food processing are examined. Aspects covered include: Hg in the environment and in food; cyclamates; nitrates in spinach; Pb-alloy contamination; nitrate detinning by tomatoes; plastics food container contamination; and uncontrolled thawing. VJG

## 55

**[Determination of some salts of heavy metals in wine.]**

Mekhuzla, N. A.; Zakharina, O. S.; Lipovich, L. M.

***Vinodelie i Vinogradarstvo SSSR*** No. 1, 17-21 (1974) [4 ref. Ru] [Moskovskii Filial VNIIViV "Magarach", USSR]

The standard method (GOST 5370-58) now in force for the detn. of Pb in wine is not sufficiently sensitive, and is tedious and time-consuming. The dithizon colorimetric method used is based on the reaction between Pb and dithizon which is accompanied by formation of a red complex which is extracted with chloroform in an alkaline environment. The reaction conditions must be carefully prepared, as the dithizon reacts with other heavy metals. Mineralization of the sample by the sulphate nitrogen method is proposed. The new variant of the method is described in detail; the method permits detn. of 0.05 mg Pb/l. wine. STI

## 56

**[Toxic materials in cereals - a consumer protection problem.]** Schadstoffe im Getreide - ein Problem des Verbraucherschutzes.

Seibel, W.; Ocker, H. D.

***Deutsche Müller-Zeitung*** 72 (9) 157-160 (1974) [11 ref. De] [Bundesforschungsanstalt für Getreideverarbeitung, Detmold, Federal Republic of Germany]

Contamination of cereals and cereal products (bread, flour and bakery products) with pesticides, fumigants, heavy metals, radioactive materials, carcinogenic hydrocyrbons and mycotoxin is discussed, with reference to: legislation in the Federal Republic of Germany; sources and incidence of contamination; reduction of the concn. of contaminants during processing (aspiration, washing, husking and milling); problems of use of contaminant-enriched by-products, e.g. bran, in animal feeds; and prospects for reduction of the level of contamination of cereals. AJDW

## 57

**[The determination of microamounts of lead in fatty oils, fatty acids and their derivatives.]**

Noguchi, C.; Hirayama, H.; Shige, T.; Tsuji, K.; Matsubara, S.; Mimura, K.; Murase, Y.; Yamashita, T.; Yamanaka, K.; Watanabe, H.

***Journal of Japan Oil Chemists' Society [Yukagaku]***

23 (3) 154-162 (1974) [6 ref. Ja, en] [Nippon Oils & Fats Co. Ltd., 1-5 Yurakucho, Chiyoda-ku, Tokyo]

Rapid and precise methods for determining microamounts of Pb in fatty oils, fatty acids and their derivatives were studied. The sample was carbonized with $H_2SO_4$ by heating in the range 250-280°C, then 30% $H_2O_2$ was gradually added to destroy organic matter. By applying this method, digestion was carried out rapidly, as compared with conventional methods such as dry ashing and wet digestion. Pb in the digest obtained was determined by spectrophotometry and atomic absorption spectrometry. In the former, Pb was extracted as a dithizone complex from the digest and the extract was determined spectrophotometrically using the max. absorbance at 520 nm. In the latter method, a complex produced by adding sodium diethyldithiocarbamate was extracted with methyl isobutyl ketone. The extract was directly injected into an air-hydrogen or air-acetylene flame, and the spectral line of Pb was measured at 283.3 nm. The proposed methods were tested by collaborative studies on soybean oil with known added amounts of Pb. Results obtained had a satisfactory agreement with theoretical values. AS

## 58

**[A rapid thin layer chromatographic test for toxic metals in water.]** Dünnschicht-chromatographischer Schnelltest auf toxische Metalle in Wasser.
Schwedt, G.; Lippmann, C.
***Deutsche Lebensmittel-Rundschau*** 70 (6) 204-206 (1974) [3 ref. De, en, fr] [Chem. Untersuchungsamt, Hagen, Federal Republic of Germany]

A rapid test for heavy metals (Bi, Cd, Co, Cu, Fe, Hg, Ni, Pb, Zn) in water is described. Interfering substances (e.g. detergents, oils) are first separated from the water by extraction with chloroform. The heavy metals are then extracted at pH 4.6 as diethyldithiocarbamate derivatives; the extract is evaporated to dryness, dissolved in acetone/chloroform (1:1) and separated on kieselgel TLC plates using a benzene or a benzene/hexane (5:1) solvent system. The metals are identified by their characteristic colour reactions with dithizone. Detection limit for the individual metals is <1 µg, except for Bi which has a higher detection limit [not given]. AJDW

## 59

**[Determination of toxic metals in meat by X-ray fluorescence analysis.]** Schadmetallbestimmung in Fleisch mit Hilfe der Röntgenfluoreszenzanalyse.
Forschner, E.; Wildanger, W.; Beitz, L.; Haase, I.; Müller, L.
***Fleischwirtschaft*** 54 (3) 529-531 (1974) [4 ref. De, en, fr] [St. Veterinäruntersuchungsamt, 3300 Braunschweig, Hohetorwall 14, Federal Republic of Germany]

Methods for determination of As, Sn, Cd, Pb and Hg in meat or muscle biopsies are discussed, with reference to proposed tolerances in the Federal Republic of Germany. Limitations of atomic absorption spectroscopy, inverse polarography and neutron activation analysis are discussed. X-ray fluorescence spectroscopic studies on samples of minced meat (containing 0.01-5.0 ppm of added As, Sn, Cd, Pb or Hg salts, singly or in combination) are described. Detection limits for 200 s and 1000 s determination times were, respectively (ppm): Pb 0.07 and 0.03; As 0.035 and 0.015; Hg 0.065 and 0.03; Sb 0.55 and 0.25; and Cd 0.076 and 0.03. Good agreement was obtained for determination of the metals alone or in mixtures. RM

## 60

**I. An inexpensive conductivity detector for gel permeation chromatography. II. The determination of lead in food and drug dyes by perchloric acid ashing and atomic absorption spectrophotometry. III. An instrument for the measurement of ultrasonic attenuation.**
Ford, A. M.
***Dissertation Abstracts International, B*** 33 (12, Part 1) 5705: Order no. 73-13342 (1973) [En] [Kansas St. Univ., Manhattan, 66502, USA]

A brief description is given of a conductivity monitor for use in gel permeation chromatography, and of an ultrasonic instrument for determining kinetic parameters of solvent molecules bound to metal chelates dissolved in various solvents. Details are also given of a method which reduces from 10 h to 2 h the time taken for the analysis of 10-20 ppm Pb in F D & C dyes. Perchloric-nitric acid is used for the ashing. The Pb (extracted into xylene) is determined by atomic absorption spectrophotometry using Pb cyclohexane butyrate as standard. MEG

## 61

**[Air pollution and vegetable cultivation.]** Luftverunreinigung und Gemüsebau.
Kloke, A.
***Erwerbsgärtner*** 28 (11) 402-404 (1974) [De] [Biol. Bundesanstalt, Berlin (West)-Dahlem]

This review-type article deals with S, F, Cd, Hg and Pb contamination of vegetable crops and with some factors influencing the contamination. SKK

## 62

**[Lead in plants and animals. I. Lead in fuels, internal combustion gases, fodders and foods: a review.]** Blei in Pflanzen und Tieren. I. Blei in Treibstoffen, Autoabgasen, sowie in Futter- und Nahrungsmitteln, ein Überblick.
Kopp, C.
***Tierärztliche Umschau*** 29 (5) 273-275 (1974) [28

ref. De] [Tierhygienisches Inst., 7800 Freiburg/Br., Federal Republic of Germany]

Data for Pb contents of drinking water, and various foods of plant and animal origin are quoted from the literature. SKK

## 63

**[Daily lead intake in farmers' diet in the immediate vicinity of a lead works.]** aufnal mit der Bauernkost aus dem Emissionsgebiet einer Bleihütte. [Lecture]
Kerin, Z.
***Protectio Vitae*** **17** (1) 22-23 (1972) [10 ref. De, en, fr] [Inst. für Arbeitsmedizin, Belgrade, Yugoslavia]

The determine the potential intake of lead by farmers living near a lead works, samples of vegetables (lettuce, carrots, cauliflower, peeled potatoes, raw sauerkraut), fruit (unpeeled apples), bread, apple puree, meat (cooked beef, cooked chicken, cooked smoked pork, smoked meat and sausage), milk, and prepared dishes (beef soup with noodles, roasted potatoes) and of whole meals (breakfast, lunch, dinner) were analysed for Pb content by the method of Kerin [Mikrochimica Acta (1968) No. 5, 927-933] involving use of dithizone and measurement at a wavelength of 516 nm. Comparison was made (for all but the whole meals) with mean contents in other urban and rural areas. The greatest source of Pb for all 3 areas was bread, values (mg/kg fresh substance) ranging from 0.65 to 5.23 in the contaminated area, vs. 0.50 and 0.35 for the urban and rural areas, respectively. Lettuce (0.15-5.11 vs. 0.13 and 0.09), carrots (0.06-1.28 vs. 0.04 and 0.02), apples (0.32-1.66 vs. 0.0 and 0.05) and sauerkraut (0.30-1.81 vs. 0.05 and 0.05) were the other main sources of intake. HBr

## 64

**Lead and cadmium in baby foods.**
Snodin, D. J.
***Journal of the Association of Public Analysts*** **11** (4) 112-119 (1973) [36 ref. En] [Sci. Adviser's Dept., Canynge Hall, Whatley Road, Bristol BS8 2PR, UK]

A solvent extraction/atomic absorption method for detn. of Pb and Cd in baby foods is described. 10 g homogenized samples are dry ashed, treated with 5 ml water and 5 ml HCl, evaporated to dryness, mixed with 1.0 ml HCl and 3-5 ml water, and made up to 25 ml. Immediately after addition of 0.5 ml 10% ascorbic acid, 1.50 ml of 1% diethylammonium diethylthiocarbamate solution in methyl isobutyl ketone is added, and the mixture is shaken for 30 s. The organic layer is then aspirated into the spectrophotometer. No significant interference by Fe, Zn or Cu was observed. The reproducibility of the method was acceptable; recovery was 70-95% for Pb, and 90% for Cd. For a 10 g sample, the detection limit was 0.02 ppm Pb and 0.002 ppm Cd. Tables of values are given for the Pb and Cd concn. in 8 samples of dried milk, 21 samples of other dried foods, 3 samples of rusks, 7 samples of canned baby foods and 7 samples of bottled baby foods. Ranges of values (for Pb and Cd respectively) were (ppm); dried milk <0.01 and 0.001-0.004; other dried foods <0.01-0.12 and 0.002-0.010; rusks 0.05-0.15 and 0.025-0.065; canned foods 0.05-0.20 and 0.010-0.080; and bottled foods <0.05-0.15 and <0.005-0.060. AJDW

## 65

**Drinking water as a source of lead pollution.**
Goldberg, A.
***Environmental Health Perspectives*** No. 7, 103-105 (1974) [2 ref. En] [Univ. Dept. Materia Medica, Stabhill General Hospital, Glasgow, G21 3UW, UK]

Pb poisoning was found in some inhabitants of houses in the Scottish Highlands exposed to soft water and Pb-lined drinking water tanks. Further investigations were carried out on clinical and metabolic effects of Pb acquired by drinking soft domestic water from Pb plumbing systems in 23 Glasgow households. Pb content of water from cold taps was ≤18 times the upper acceptable limit and was proportional to the amount of Pb in the plumbing system. Blood Pb of 71 inhabitants of these houses showed a significant positive correlation with water Pb content. Delta aminolaevulic acid dehydrase activity, an extremely sensitive indicator of Pb exposure, showed a significant negative correlation with water Pb content. Atmospheric Pb was within acceptable limits in all but one house and no significant correlation could be found with biochemical measurements. A small number of clinical abnormalities were found but could not be directly attributed to Pb toxicity. The results of the study underline the possible danger to health of Pb plumbing systems in soft-water regions. AS

## 66

**The uptake of lead by vegetables from soil.**
Crudgington, D. R.; Markland, J.; Vallance, J.
***Journal of the Association of Public Analysts*** **11** (4) 120-126 (1973) [2 ref. En] [County Analyst's Dept., County Offices, Matlock, Derbyshire, UK]

Soils from gardens mainly in the Mattock area of Derbyshire were analysed for Pb, Zn and Cd contents by atomic absorption spectrophotometry and fruit from these gardens were analysed for Pb by dithizone extraction and subsequent colorimetric determination. Peas, broad beans, kidney beans lettuces, Brussels sprouts, cabbge, cauliflower, broccoli, potatoes, carrots, parsnips, beets, onions, tomatoes, grapes, gooseberries and blackcurrants were analysed and results tabulated in detail. They provided no evidence that the plants analysed accumulated Pb from the soil. However, there was

evidence of Pb in whole samples of root-vegetables but these were difficult to wash free of soil e.g. whole potatoes contained 0.86 ppm of Pb whereas peeled tubers contained only 0.17 ppm and the peel, 4 ppm. CRI

## 67

**Lead content of foodstuffs.**
Mitchell, D. G.; Aldous, K. M.
***Environmental Health Perspectives*** No. 7, 59-64 (1974) [8 ref. En] [New York St. Dept. of Health, Albany, USA]

Mean Pb concn. of 122 canned products was 167 µg/ml vs. 42 µg/ml for 97 bottled products. 37% of 86 samples of canned baby foods (mainly fruit juice and fruit juice mixtures) contained >200 µg Pb/l., while only 1 of 35 bottled baby foods (mainly puree dinners) contained >100 µg/l. Pb levels in 270 samples of bulk fresh milk averaged 40 µg/l., and none exceeded 200 µg/l.; however, in 51 samples of evaporated milk in soldered-seam cans, Pb concn. ranged from 10 to 820 µg/l., 55% of samples having >200 µg/l. It is concluded that these foods may make a significant contribution to the lead body burden of young children. CDP

## 68

**[Contamination of foods with heavy metals.]**
Cumont, G.
***Bulletin Technique d'Information*** No. 287, 83-88 (1974) [10 ref. Fr] [Lab. Central d'Hygiene Alimentaire, 43, Rue de Dantzig, 75015 Paris, France]

## 69

**Influence of dietary factors on the gastrointestinal absorption of lead.**
Garber, B. T.; Wei, E.
***Toxicology and Applied Pharmacology*** **27** (3) 685-691 (1974) [21 ref. En] [Univ. of California, Berkeley, 94720, USA]

In gastrointestinal absorption studies with orally administered labelled lead acetate ($^{210}$Pb) in mice, the chelating agents nitrilotriacetic acid and sodium citrate increased absorption of lead, as did orange juice. On the other hand, milk, EDTA and diethylene triaminepentaacetic acid did not significantly affect lead absorption. EJM

## 70

**Atomic absorption determination of lead in apples.**
Markus, J. R.
***Journal of the Association of Official Analytical Chemists*** **57** (4) 970-972 (1974) [2 ref. En] [Div. of Field Operations, FDA, Rockville, Maryland 20852, USA]

2 studies have been conducted on the analysis of apples for Pb by atomic absorption spectrophotometry using the official first action method, 25.B01-25.B05. 16 laboratories participated in each study. Recoveries ranged from 92.6 to 110% (101.6% average) in the first study. A second study in which procedural modifications were made, showed recoveries ranging from 91.2 to 109.7%, with an average of 100.0%. Coeff. of variation for the first and second studies were 5.19 and 4.94%, respectively. On the basis of the second study, procedural modifications have been incorporated into the 12th Edition of Official Methods of Analysis. AS

## 71

**Occurrence of lead in tuna.**
Chow, T. J.; Patterson, C. C.; Settle, D.
***Nature, UK*** **251** (5471) 159-161 (1974) [6 ref. En] [Scripps Inst. of Oceanography, Univ. of California, San Diego, La Jolla, 92037, USA]

Pb was determined in samples of various tissues (muscle, fin, epidermis, dermis, gill filaments) of 3 spp. of tuna, yellowfin (Neothunnus macropterus), skipjack (Katsuwanus pelamis) and albacore (Thunnus alalunga) and in commercial canned tuna, by a stable isotope dilution technique. The samples were dried and ashed in a muffle oven, by low temp. ashing with an excited $O_2$ plasma, or by wet acid oxidation; weighed amounts of lead isotope tracer were added during digestion and oxidation. The lead isotope mixtures were then isolated by ion exchange and solvent extraction, and analysed by MS. The analyses were conducted by special clean-laboratory chemical techniques. Tables of results are given. Results showed that fresh tuna muscle contained only 0.0003 ppm Pb; epidermis (including surface slime) contained ≤1.7 ppm Pb. The 2 canned tuna samples tested contained 0.10 and 0.93 ppm Pb. It is considered that considerable contamination with commercial lead occurs during processing and canning of tuna, and that accurate determination of Pb is dependent on elimination of contamination of samples with Pb in the laboratory. AJDW

## 72

**Lead and cadmium content of selected Oregon groundfish.**
Childs, E. A.; Gaffke, J. N.
***Journal of Food Science*** **39** (4) 853-854 (1974) [11 ref. En] [Oregon St. Univ., Seafoods Lab., Astoria, 97103, USA]

The Pb and Cd content of selected Oregon groundfish was determined. Rex sole (Glyptocephalus zachirus), English sole (Parophrys vetulus), Dover sole (Microstomus pacificus), petrale sole (Eopsetta jordani), orange rockfish (Sebastes pinniger), lingcod (Ophiodon elongatus), Pacific hake (Merluccius productus), starry flounder (Platichthys stellatus) and sand sole (Psettichthys melanostictus) samples had mean Pb and Cd contents of <0.25 ppm. Therefore Oregon groundfish would not be a source of toxic levels of Pb and Cd in the diet. [See also FSTA (1974) 6 3R141.] IFT

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FAB 28

# CONTENT AND ANALYSIS OF LEAD IN FOODS

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FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

**under the direction of**

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

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H. BROOKES

ASSISTANT EDITOR

### 1

**Significance of chemical residues in United States food-producing animals.**
Oehme, F. W.
***Toxicology*** **1** (3) 205-215 (1973) [49 ref. En] [Comparative Toxicology Lab., Kansas St. Univ., Manhattan, 66506, USA]

The significance of chemical residues in food-producing animals is discussed. Classes of residues considered are: antibiotics; drugs other than antibiotics; pesticides; and heavy metals and trace elements. Socio-health and political problems of residues are considered. VJG

### 2

**Food exposures to lead.**
Kolbye, A. C., Jr.; Mahaffey, K. R.; Fiorino, J. A.; Corneliussen, P. C.; Jelinek, C. F.
***Environmental Health Perspectives*** No. 7, 65-74 (1974) [17 ref. En] [Bureau of Foods, FDA, Washington, DC, USA]

In a survey carried out in 1972, which involved nationwide sampling of foods representing the average diet of an 18-yr-old male, the main components of the diet were dairy products (26.1% of total diet), beverages, including water (24.9%), grain and cereal products (12.6%), meat, fish and poultry (9.9%), fruit (7.4%) and potatoes (7%). The average dairy Pb intake was 57.4 µg when zero and trace amounts were ingored; if trace amounts were taken as 0.09 ppm, average daily intake was 159 µg, and if zero amounts were additionally taken as 0.05 ppm, intake was 233 µg. The greatest proportion of the daily intake of Pb was obtained via legume vegetables although this food group formed only 2.5% of the total diet. Daily Pb intake was estimated to be 73-75 µg in 2-yr-old children whose diet included 35.8% dairy products and 24.8% beverages, and 116-119 µg in 6-month-old infants with 58.9% dairy products and 12.9% beverages in the diet. Some FDA programmes related to food surveillance, epidemiology and toxicological investigation are briefly described. CDP

### 3

**[Metals and metalloids in water. (Their importance to man).]** Metalle und Metalloide im Wasser. (Beurteilung ihrer Bedeutung für den Menschen).
Borneff, J.
***Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IB*** **158** (6) 524-529 (1974) [10 ref. De, en] [Hygiene-Inst., Univ., Mainz, Federal Republic of Germany]

The occurrence of heavy metals and metalloid elements (including Be, Hg, Mo, Se, As, Cd, Cr, Ca, Cu, Ni, Pb, Zn) in water supplies (especially drinking water) is discussed, with reference to: toxicological significance; legislation; the significance of water as a source of trace elements; pollution of surface water, lakes and rivers; surveillance of the toxic metal concn. in surface waters; and concentration of toxic metals in aquatic organisms. AJDW

### 4

**[Use of emission spectral analysis to determine heavy metals in canned vegetables and fruit, and in baby foods.]**
Manchev, P.
***Nauchni Trudove, Nauchnoizsledovatelski Institut po Konserva Promishlenost, Plovdiv*** **9**, 183-193 (1972) [10 ref. Bg, en]

A procedure was devised for application of atomic emission spectral analysis to determine Zn, Cu, Sn, Fe and Pb in canned vegetables and fruit and in baby foods. Detailed description 8 are given of sample preparation, standards preparation, spectra recording, and qualitative and quantitative determination of the content of heavy metals in 13 canned food varieties, both spectrographically and photocolorimetrically. Emission spectral analysis is recommended as a speedy and accurate method for this purpose. STI

### 5

**[Heavy metals in durum wheat and durum wheat products.]** Schwermetalle in Durumweizen und -erzeugnissen.
Ocker, H.-D.
***Getreide, Mehl und Brot*** **28** (8) 204-208 (1974) [22 ref. De] [Bundesforschungsanstalt für Getreideverarbeitung, Detmold, Federal Republic of Germany]

After a brief discussion of proposed tolerances r heavy metals (Pb, Hg, Cd, As) in cereals and cereal products in the Federal Republic of Germany, a series of studies on heavy metal contamination of common wheat, durum wheat and rye is briefly described, with reference to tables and graphs of results. Nearly all samples of domestically produced wheat and rye met the proposed tolerances, as did a sample of Canadian durum wheat. Studies on removal of heavy metals during processing showed that washing was relatively ineffective but that dry husking effectively separated the heavy metal-rich surface layers from the grain. White flour contained approx. 40% of the initial heavy metal concn.; high-extraction flours, bran and milling by-products sometimes contained relatively high heavy metal concn. The proposed tolerances are discussed in relation to these observations. AJDW

### 6

**[Methods for the determination of trace quantities of metals in edible fats.]**
Rudzka, Z.
***Tluszcze Jadalne*** **17** (1) 39-49 (1973) [26 ref. Pl] [Inst. Badawczy Przemyslu Tluszczowego, Warsaw, Poland]

Admissible contents of metals (As, Pb, Ni, Fe, Cu) in edible oils and fats are compared with respect to the proposals of the World Health Organization, Polish standards (As, Pb, Ni) and literary data. A survey of methods for determining

trace quantities of metals in fats is presented according to Polish standards and literary data, and the possibility of applying the methods to the determination of metal contents in foods is discussed. The following methods are dealt with: determination in aqueous solutions obtained by extraction; using dry or wet mineralization; and direct determination of metals in oils by colorimetric methods or by atomic adsorption.
STI

## 7

**[Residues of contaminants in milk.]**
Fremdstoffrückstände in Milch.
Brandl, E.
***Österreichische Milchwirtschaft*** 29 (17) 305-309 (1974) [15 ref. De] [Tierärztliche Hochschule, Vienna, Austria]

This general review deals with residues of pesticides, antibiotics and other veterinary medicaments, detergents and disinfectants, radioactive isotopes and, in particular, haevy metals (Pb, Hg and Cd) and aflatoxins in milk and milk products. ADL

## 8

**Health laws and regulations - Denmark.**
World Health Organization
***International Digest of Health Legislation*** 24 (4) 744-777 (1973) [En] [Geneva, Switzerland]

A selection of Danish health laws and regulations is presented including the following which relate to food hygiene: Order No. 449 of 9 Oct., 1972 on minarine (a spreadable emulsion containing ⩾39 and ⩽41% fat and ⩾5% water); Order No. 450 of 11 Oct., 1972, on ceramic and enamelled articles and glassware for use in connection with foodstuffs, which prescribes permissible levels of Pb and Cd to be released from food utensils; Order No. 492 of 24 Nov., 1972, to amend the Order concerning milk and cream, and products derived from milk (milk products) (principal amendments relate to partly skimmed milk with fat content 1.50-1.80%, min. fat content of double cream, and vitamin A and D addition to partly skimmed milk); Law No. 186 of 30 March, 1973, on the production of dairy products, wholesale trade in these products etc. (applies to production, handling, treatment import and export of, and wholesale trade in butter, cheese, milk product preserves and ice-cream and milk ices);
VJG

## 9

**[Lead in plants and animals. II. Lead uptake, lead accumulation and lead poisoning in animals.]** Blei in Pflanzen und Tieren. II. Die Bleiaufnahme, Bleispeicherung und Bleivergiftungen bei Tieren.
Kopp, C.
***Tierärztliche Umschau*** 29 (6) 318-320, 322-323 (1974) [29 ref. De] [Tierhygienisches Inst., Freiburg, Federal Republic of Germany]

Lead poisoning of food animals is discussed; aspects considered include: uptake of Pb (with reference to sources of Pb, and the solubility of Pb and Pb compounds); distribution of Pb in the body (with reference to literature data for the Pb concn. in the blood, muscle tissue, liver and kidneys of Pb-poisoned and non-poisoned animals); factors influencing the toxic effects of Pb; symptoms of Pb-poisoning: Pb intakes necessary for chronic and acute poisoning; methods for detection of Pb poisoning (determination of δ-aminolevulinic acid in the urine, or δ-aminolevulinic acid dehydratase activity in the blood); and therapy of Pb-poisoned animals. [See FSTA (1974) 6 11C364 for part I.]
AJDW

## 10

**[Pollution of plants and soil with lead from petrol engines.]** Verunreinigung von Pflanzen und Böden durch Bleirückstände aus Benzinmotoren.
Horak, O.; Huber, I.
***Bodenkultur*** 25 (1) 34-47 (1974) [26 ref. De, en] [Inst. für Landwirtschaft, Forschungszentrum, Seibersdorf, Austria]

The following values (ppm in DM) are included in tabulations presenting Pb contamination of various plants growing in the proximity of arterial Austrian roads: winter wheat (15-60 m from motorway) 5-77; maize (4-50 m) 6-91; and sugar beet (root, 10 m) 2. SKK

## 11

**[Copper, zinc and lead in wine from the province of Lecce destined for export.]**
Martina, S.; Caravella, R.; Barbagallo, R. M.
***Rivista di Viticoltura e di Enologia*** 26 (12) 509-512 (1973) [4 ref. It] [Lab. Provinciale d'Igiene e Profilassi, Lecce, Italy]

Samples of red wine (for export) of vintages 1970, 1971 and 1972 taken from 5 regions (1970), 17 regions (1971) and 17 regions (1972) of Lecce province (in all 92 samples) were analysed for alcohol content (ml %) and contents of Cu, Zn and Pb (ppm). It was found that none of the samples tested contained any of the 3 metals in a quantity greater than that allowed by law, i.e. 1 mg/l. Cu, 5 mg/l. Zn and 0.3 mg/l. Pb. LA

## 12

**[Lead and cadmium contents of fruit juices and grape musts.]** Blei- und Cadmiumgehalte von Fruchsäften und Traubenmosten.
Wallrauch, S.
***Flüssiges Obst*** 41 (4) 134-135 (1974) [6 ref. De] [Landesuntersuchungsamt für das Gesundheitswesen Nordbayern, Chem. Untersuchungsanstalt, Würzburg, Federal Republic of Germany]

Lead and cadmium contents were determined by flameless atomic absorption in a large number of bottled and canned orange juices, apple juices, sweet cherry-musts, grape juices, and also grape musts of increasing Oechsle value. Results showed that the max. permitted levels for fruit juices of 0.3 ppm lead and 0.05 ppm cadmium were exceeded in none of the tests. Highest lead contents occurred in canned orange juice (0.17 ppm). Cadmium levels were well under the limits in trade products, but relatively close to the limits in some grape musts. Increases with increasing Oechsle values were absent or not significant. MJD

## 13

**[Trace-element composition of the Caspian basin fish fauna.]**
Patin, S. A.; Morozov, N. P.; Nikonenko, E. M.; Bakunov, N. A.; Fedotova, L. V.
***Trudy Vsesoyuznogo Nauchno-issledovatel'skogo Instituta Morskogo Rybnogo Khozyaistva i Okeanografii*** **100**, 40-44 (1974), [5 ref. Ru, en] [Vses. Nauchno-issled. Inst. Morskogo Rybnogo Khozyaistva i Okeanografii, Moscow, USSR]

Contents of Zn, Fe, Sr, Mn, Ni, Pb, Cr, Cu, Co and Cd determined by atomic absorption spectrophotometry are graphically presented for (i) 11 spp. of fresh-water fish and (ii) 12 spp. of sea and anadromous fishes from the Caspian basin. Mean contents with SEM are tabulated for (i) and (ii). The mean values, in the order of elements listed above were respectively (mg/kg fish): 20.6 and 16.2, 5.6 and 10.0 ($P = 0.05$) 6.2 and 5.7, 2.2 and 1.2 ($P = 0.05$), 1.9 and 1.6, 1.7 and 1.1, 1.3 and 1.2, 0.6 and 1.6 ($P = 0.05$), 1.0 and 1.4 and 0.4 and 0.3. Correlation coeff. between contents of some of the elements and of ash are listed. SKK

## 14

**[Contents and distribution of trace elements in fresh-water fish of the upper Tuloma reservoir.]**
Patin, S. A.; Morozov, N. P.; Buyanov, N. I.
***Trudy Vsesoyuznogo Nauchno-issledovatel'skogo Instituta Morskogo Rybnogo Khozyaistva i Okeanografii*** **100**, 51-54 (1974) [8 ref. Ru, en] [Vses. Nauchno-issled. Inst. Moorskogo Rybnogo Khozyaistva i Okeanografii, Moscow, USSR]

Contents of Fe, Zn, Cr, Sr, Ni, Co, Pb, Cu and Mn determined by atomic absorption spectrophotometry are graphically presented for muscles, skin, skeleton, gills, fins and scales of pike, turbot, whitefish and perch from the upper Tuloma river reservoir in the Kola peninsula. Concn. in muscles decreased in the order of elements listed above and were within the total range of 0.3-10 mg/kg muscle. SKK

## 15

**[Heavy metals in commercial fishes of the southern Atlantic.]**
Morozov, N. P.; Tikhomirova, A. A.; Tkachenko, V. N.
***Trudy Vsesoyuznogo Nauchno-issledovatel'skogo Instituta Morskogo Rybnogo Khozyaistva i Okeanografii*** **100**, 45-50 (1974) [2 ref. Ru, en] [Vses. Nauchno-issled. Inst. Morskogo Rybnogo Khozyaistva i Okeanografii, Moscow, USSR]

Contents of Zn, Fe, Sr, Cu, Pb, Cr, Mn, Ni, Co and Cd determined by atomic absorption spectrophotometry in muscle, skin, skeleton, gills, fins and scales of sea bream, Micromesistius poutassu, horse mackerel, 'Magellani', hake, tunny, 'Gorbyl' and shark are graphically presented. The fish were caught during the 1965 voyage of the research ship 'Akademik Knipovich' in the southern (including the Antarctic) sector of the Atlantic. Data on ash contents are also presented. SKK

## 16

**[Heavy metals in waters and fish of the Baltic basin.]**
Morozov, N. P.; Demina, L. L.; Sokolova, L. M.; Prokhorycheva, N. P.
***Trudy Vsesoyuznogo Nauchno-issledovatel'skogo Instituta Morskogo Rybnogo Khozyaistva i Okeanografii*** **100**, 32-36 (1974) [5 ref. Ru, en] [Vses. Nauchno-issled. Inst. Morskogo Rybnogo Khozyaistva i Okeanografii, Moscow, USSR]

Contents of Fe, Zn, Ni, Cr, Sr, Cu, Pb, Mn, Co and Cd determined by atomic absorption spectrophotometry are tabulated for muscles of kilka, Baltic herring (2 locations), roach and bream and for whole kilka and sprat from the Baltic basin. Concn. of the metals studied decreased in the order listed above and were, in general, 100-1000 × higher than in the corresponding sea water. SKK

## 17

**[Factors influencing the toxicity of heavy metals in food.]** [Review]
Huisingh, D.; Huisingh, J.
*Ecology of Food and Nutrition* **3** (4) 263-272 (1974) [many ref. En] [St. Univ., Raleigh, N. Carolina, USA]

The following factors influencing the tolerance for heavy metals in food are discussed: the form of the metal; metabolic defence mechanisms; interactions with other elements; the stage of development of the organism and its health status in relation to susceptibility to heavy metals; and effects of the use of heavy metals in agriculture and food processing on concn. in food. The provisional tolerable weekly intake of Cd, Hg and Pb is discussed in relation to current levels. The establishment of a standardized international food monitoring network is proposed. RM

## 18

**[Dangers of contamination with lead from motor vehicle exhaust gases.]** Gefahren der Blei-Immission durch Kraftfahrzeugabgase. [Review]
Adler, G.; Oelschläger, W.; Menke, K. H.

***Übersichten zur Tierernährung*** **2** (1) 59-84 (1974) [many ref. De, en] [Abteilung Tierernährung der Univ. Hohenheim, Federal Republic of Germany]

Contamination of the environment (including foods) with Pb is discussed, on the basis of literature data. Aspects considered include: sources of contamination (Pb smelting plants, Pb-containing pigments, motor vehicle exhausts); Pb concn. in water; Pb in feeds and foods of plant origin; Pb absorption, retention and elimination by animals (including food animals); and Pb concn. in milk and tissues of domestic animals. AJDW

## 19

**Uptake of cadmium, zinc, copper, lead and chromium in the Pacific oyster, Crassostrea gigas, grown in the Tamar river, Tasmania.**

Ayling, G. M. (**Australia**, Tasmanian Department of the Environment)

***Water Research*** **8** (10) 729-738 (1974) [13 ref. En] [Tasmanian Dept. of the Environment, 161 Davey St., Hobart, Tasmania, Australia]

Oysters and mud samples from sites along the Tamar river were analysed for Cd, Cu, Zn, Pb and Cr. Cu and Cr were apparently absorbed by some physiological process to a max. concn. limited by oyster size and were independent of metal concn. in mud. Pb was randomly incorporated in sites with high Pb concn. Zn and Cd accumulation depended mainly on the metal concn. in mud. Mean dry wt. concn. of metals in oysters and mud samples respectively ranged from (ppm): Cd, 4.2-134 and 0.4-5.7; Cu, 200-1700 and 3-224; Pb, 0-135 and 4-1500; Cr, 1-37 and 2-88; and Zn, 1700-14 000 and 20-500. AL

## 20

**An industry viewpoint on solutions for food safety problems.**

Steele, G. G. E.

***Food in Canada*** **34** (11) 26-28 (1974) [En]

Food safety in Canada is discussed, with special reference to: the recall system, which ensures that if a particular lot of products has to be recalled from the distribution network, this can be achieved in the minimum time; nutritional problems; the need for a central research facility using sophisticated analytical techniques and equipment to detect the presence of heavy metals, such as Pb and Hg, in foods; and import considerations. AA

## 21

**[Heavy metals in cereals and cereal products.]**

Schwermetalle in Getreide und Getreideerzeugnissen.

Ocker, H.-D.; Nierle, W.

***Getreide, Mehl und Brot*** **28** (11) 285-288 (1974) [5 ref. De]

Studies on the heavy metal (Hg, Pb and Cd) content of cereals and cereal products are discussed. Tables and graphs of values are given for the heavy metal content of samples of wheat and rye grown in the Federal Republic of Germany, imported samples of rice, durum wheat and durum wheat products and oats and oat products. Heavy metal concn. were within acceptable limits except for some samples of rice which contained ≥100 ppb Hg. Studies were also conducted on separation of heavy metals by dry husking; results for wheat showed that Pb concn. can be reduced by 75%, Hg concn. by 50%, and Cd concn. by only 10-20%. Considerable decontamination (with accumulation of heavy metals in the bran) also occurs during milling. Selective absorption of heavy metals by rice gluten was observed. AJDW

## 22

**The lead and cadmium content of milk from industrial areas of England and Wales.**

[Conference proceedings]

Harding, F.; Morris, J. L.; Coates, P. J.

***XIX International Dairy Congress*** **1E**, 580-581 (1974) [2 ref. En] [Milk Marketing Board, Thames Ditton, UK]

Of 193 milk samples taken monthly between Aug. 1972 and July 1973 from farms or dairies, mainly near industrial areas throughout England and Wales, the % containing <0.02, 0.02, 0.03, 0.04, 0.05, 0.06, and 0.07 ppm Pb respectively was 44.7, 23.3, 21.2, 4.1, 3.6, 2.6 and 0.5. Of 154 samples tested for Cd, 40.9, 26.7, 13.7, 6.5, 3.2, 8.4 and 0.6% contained respectively ($\times 10^{-3}$) <1, 1, 2, 3, 4, 5 and 6 ppm Cd. DMK

## 23

**[Effect of atmospheric pollution on foods. Determination of lead in milk and butter.]**

Marletta, G. P.

***Industrie Alimentari*** **13** (10) 113-117 (1974) [23 ref. It, en] [Istituto di Merceologia, Facolta Economia e Commercio, Univ. degli Studi di Trieste, Italy]

The accuracy of a method for Pb determination by ashing and atomic absorption spectrophotometry was tested by adding Pb to milk butter: recovery was 93-98%. Average Pb content in samples of 29 types of milk (pasteurized or sterilized market milk, untreated milk from alpine pastures, etc.) from the Friuli-Venezia Giulia area of Italy was 34.8 μg/l. (range 17.3-51.9 μ/l.), excluding 3 samples from one locality which average 134.2 μg/l., probably owing to accidental contamination. Average content in 25 butters from dairies and from alpine pastures was 0.25 (0.17-0.46) mg/kg, excluding one alpine butter with 0.82 mg/kg. Average content in 8 brands of dried milk (diluted 1:3.5) ranged from 51.7 to 115.1 μg/l. There were no significant differences in Pb content according to the origin of the milk or butter. ADL

## 24

**Lead and zinc contents of food and diets in the Netherlands.**

Reith, J. F.; Engelsma, J.; Ditmarsch, M. van

***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **156** (5) 271-278 (1974) [29 ref. En, de] [Dept. of Food Chem., St. Univ. of Utrecht, Zeist, Netherlands]

Pb and Zn were determined by atomic absorption spectrophotometry in samples of various foods (cereal products, potatoes, sugar, honey, dairy products, meat, fish, eggs, pulses, fats, fruit, vegetables, nuts, alcoholic and non-alcoholic beverages, canned foods, and foods packaged in glass, plastics or paper) purchased in retail shops in the Netherlands. Tables of results are given. No sample contained ≥0.5 ppm Pb; evaporated milk, cheese, meat, fish, dried fruit, apple treacle, wine and some canned foods contained >0.1 ppm Pb. Relatively high Zn concn. (≥20 ppm) were detected in bread, dried milk, cheese, meat, fish, beans, nuts, cocoa and brawn. Approx. daily intakes of Pb and Zn for selected population groups were calculated, and compared with corresponding data for other countries. AJDW

## 25

**[Lead contamination of daily food intake in the vicinity of a North German lead smelting works.]** Die Bleibelastung der täglichen Nahrung in der Umgebung einer norddeutschen Bleihütte.
Rathjen, B.; Stelte, W.
***Ernährungs-Umschau*** **21** (8) 239-241 (1974) [4 ref. De, en] [Inst. für Ernährungswissenschaft I, Justus Liebig-Univ., Giessen, Federal Republic of Germany]

Between Feb. and June 1972, 97 cattle in the vicinity of a North German lead works died or were killed for suspected Pb poisoning, attributed to emulsions from a chimney with a faulty filter system. As 30 000 people live in the area, some of whom consume locally grown fruit and vegetables, checks for Pb were carried out on 18 persons (6 men, 6 women, 6 children) for 14 days in Aug./Sept. and their vegetable and fruit intake recorded. The Pb contents of various locally grown fruit and vegetables were also determined. The results showed an average lead intake of 0.45 mg/day; the WHO/FAO permissible limit is 0.423 mg/day (not applicable to young persons). In reality the figure was probably 2-3 × higher as June and July were not covered and the Pb levels had already receded by August. Pb intake was probably reduced because of an efficient consumer education through local medical authorities. FSB

## 26

**Stable lead and $^{210}$Pb in the food chain lichen-reindeer-man.** (In "Comparative studies of food and environmental contamination. Proceedings of a symposium on nuclear techniques in comparative studies of food and environmental contamination, held in Otaniemi, Finland, 27-31 August, 1973".) [Conference proceedings]
Persson, R. B. R.
pp. 231-247 (1974) [42 ref. En] Vienna, Austria; International Atomic Energy Agency [Univ. of Lund, Lasarettet, Lund, Sweden]

Pb concn. was studied in lichen samples collected during the period 1882-1972 and results presented for each decade. Reindeer slaughtered in 1970 and 1971 were analysed for Pb, also bone and flesh samples collected for 1966-1969 and 1968-1969. The $^{210}$Pb/Pb ratios in the different organs were found to be quite constant at about 0.3 mCi/kg. The $^{210}$Pb activity in lichen was also found to be constant at 0.6 mCi/kg. The $^{210}$Pb activity in the blood of reindeer-eating humans was about 3-5 pCi/kg wet wt. A comparative study of the transfer of both $^{210}$Pb and stable Pb through the food chain showed that only about 5% of the total Pb in Lapps originates from the consumption of reindeer meat. CRI

## 27

**Lead in paper: a potential source of food contamination.**
Heichel, G. H.; Hankin, L.; Botsford, R. A.
***Journal of Milk and Food Technology*** **37** (10) 499-503 (1974) [29 ref. En] [Dept. of Ecology, Connecticut Agric. Expt. Sta., New Haven, Connecticut 06504, USA]

Many paper products, including newspapers and paper goods used in packaging foods, contain Pb. Pb on or in food packages ranged from 2 to 10 000 ppm, and varied with the quantity of printing and colour of ink. Printed packages contained more Pb than unprinted material, although some unprinted ones contained up to 58 ppm. The potential for introducing Pb into meat and milk by feeding waste paper to ruminants is explored. Negligible amounts of Pb are introduced into soils and plants from newspaper mulch. AS

## 28

**[Studies on the contamination of roadside-grown apples with lead.]** Untersuchungen zur Kontamination von Strassenäpfeln mit Blei.
Lauterbach, K.; Gottschling, E.; Konig, R.
***Nahrung*** **18** (4) 461-466 (1974) [14 ref. De, en, ru] [Hygiene Inst. des Bezirkes Erfurt, German Democratic Republic]

Comparative studies were conducted in 1971 and 1972 on the Pb content of apples grown (i) by the side of main roads or (ii) in orchards. Pb concn. of washed apples were determined by a spectrophotometric method using sodium diethyldithiocarbamate reagent. Results for 1971 were (mg Pb/kg): (i) (12 samples) range 0.23-0.35, mean value 0.27; (ii) (9 samples) range 0.22-0.27, mean value 0.25. Corresponding values for 1972 were: (i) (16 samples) 0.10-0.40 and 0.21; and (ii) (7 samples) 0.14-0.27 and 0.19. No sample exceeded the German Democratic Republic tolerance (0.5 mg/kg). The relatively small difference between the Pb concn. of (i) and (ii) apples is attributed to limited vertical diffusion of motor vehicle exhaust gases, resulting in little penetration of Pb to the height at which the apples were borne (mean value 2 m in this study). AJDW

## 29

**Atomic absorption analysis of heavy metals in factory water and granulated sugar.**
Lew, R. B.
***Journal of the American Society of Sugar Beet Technologists*** 17 (2) 144-153 (1972) [17 ref. En] [Amstar Corp., Spreckels Sugar Div., Woodland, California, USA]

Analytical methods for the analysis of a number of heavy metals, sensitive to submicrogram quantities, in factory water and granulated sugar by atomic absorption spectroscopy have been developed. The method for determining Cd, Cr, Cu, Fe, Pb, Mn, and Zn is based on concentrating the water by evaporation and the sugar by sulphated ashing, with subsequent detn. by standard atomic absorption technique. The detn. of Hg involves wet oxidation, reduction of ionic Hg$^{2+}$ to its atomic state, followed by flameless atomic absorption measurement. The As detn. is based on wet oxidation of the sample, conversion of As$^{3+}$ to AsH$_3$, and introduction of AsH$_3$ into an argon-hydrogen entrained air flame with subsequent quantification by atomic absorption. Limits of detection (corrected for dilution) ranged from 0.02 ppm of As (in sugar, 0.003 in water) to 0.0008 ppm for Zn. AS

## 30

**[Accumulation of pesticides polychlorinated biphenyls and heavy metals in fish and other aquatic animals in coastal and inland waters in Thailand.]** Untersuchungen über die Speicherung von Pestiziden, PCB und Schwermetallen in Fischen und Meerestieren aus den Küsten- und Binnengewässern Thailands.
Huschenbeth, E.
***Informationen für die Fischwirtschaft*** **21** (6) 166 (1974) [De] [Inst. für Küsten- und Binnenfischerei, Hamburg, Federal Republic of Germany]

A brief account is given of studies conducted in 1972 on a total of 819 samples of fish and other aquatic animals in Thailand; heavy metal, polychlorinated biphenyl and pesticide residue concn. gave no reason for concern. AJDW

## 31

**Lead in evaporated milk and evaporated skim milk. Proposed tolerance.**
**United States of America**, Food & Drug Administration
***Federal Register*** **39** (236, Dec. 6) 42740-42743 (1974) [En] [Washington, DC, USA]

A summary is given of unpublished data of the Pb content of milk and evaporated milk, the toxicology of Pb, and the Pb intake of various age groups of the population, from which it was concluded that a proposed 0.3 ppm Pb tolerance will provide adequate protection for infants and young children from ingestion of hazardous levels of Pb from milk. In 1972, raw and evaporated milk contained 0-0.28 (average 0.09) and 0.21-1.10 (0.52) ppm Pb respectively. Modifications in can manufacturing procedures were made as well as improvements in analytical methods. In 1974, milk (60 samples) contained 0-0.069 ppm Pb (0.021). In 1973, evaporated milk (83 samples) contained 0.02-0.37 (0.12) ppm. Industry data during first half of 1973 for evaporated milk (>3000 samples) showed 0.01-0.46 (0.12); and during the second half of 1973 and 1st 4 months of 1974 (3015 samples), 0.02-0.33 (0.12) ppm. CAS

## 32

**Improved temperature control of a Technicon continuous digestor.**
Jackson, C. J.; Morley, F.; Porter, D. G.
***Laboratory Practice*** **24** (1) 23-25 (1975) [En] [Lab. of Govt. Chemist, Cornwall House, Stamford St., London SE1 9NQ]

A simple method for improving the temp. control of a Technicon AutoAnalyzer Digestor, used as part of an automatic system for determination of trace metals in foodstuffs, was achieved by substituting proportional heating controllers for the system supplied, thus improving reliability and versatility. AL

## 33

**[Release of cadmium and lead from enamels and pigments. Studies on enamelled utensils and drinking glasses.]** Die Abgabe von Cadmium und Blei aus Emails und Schmelzfarben. Untersuchungen an Emailgeschirr und Trinkgefässen aus Glas.
Dömling, H.-J.
***Deutsche Lebensmittel-Rundschau*** **70** (12) 439-442 (1974) [15 ref. De, en, fr] [Landesuntersuchungsamt für das Gesundheitswesen Nordbayern, Erlangen, Federal Republic of Germany]

Release of Pb and Cd from (i) the inside of the lid of enamelled cooking utensils and (ii) decorated drinking glasses was studied. Heavy metal release from (i) was evaluated by boiling a 4% acetic acid solution in the container for 2 h, then leaving it to stand for a further 22 h. Pb and Cd concn. were determined by atomic absorption spectrophotometry. No Cd was released by white, blue or grey-enamelled lids; orange and red-enamelled lids released up to approx. 1.9 mg Cd/dm$^2$. (ii) were tested by standing the glass inverted in a 4% acetic acid solution for 24 h at room temp., the upper 2 cm of the glass being immersed. Cd release was ≤30 mg/dm$^2$; Pb release was ≤300 mg/dm$^2$. Recommendations for minimization of the health hazard from Pb- and Cd-containing glazes are given. AJDW

## 34

**Agricultural consequences of trace element contamination of sewage.**
Mackenzie, E. J.; Purves, D.
***Chemistry and Industry*** No. 1, 12-13 (1975) [13 ref. En] [Edinburgh School of Agric., Edinburgh, UK]

In this brief review it is mentioned that treatment of the soil with sewage sludge raised the level of Cu, Ni and Zn in the edible peats of leeks and globe beet, but excess Pb was not taken up readily by them or by potatoes, carrots, cabbages, tomatoes or wheat. AL

## 35

**[Heavy metals in cereals and cereal products.]**
Schwermetalle in Getreide und Getreideprodukten.
Seibel, W.; Ocker, H. D.; Nierle, W.
***Deutsche Lebensmittel-Rundschau*** **70** (9) 315-318 (1974) [21 ref. De, en, fr]

Problems of contamination of cereals with heavy metals are briefly discussed, with reference to literature and experimental data. Analyses of samples of wheat and rye produced in the Federal Republic of Germany in 1971 and 1972 showed Hg concn. of 0.016 ppm in wheat and 0.0065 ppm in rye. Most wheat and rye samples contained 0.1-0.2 ppm Pb; samples from an area near a zinc smelter contained ≤1.5 ppm Hg. Elimination of heavy metals from wheat during processing (cleaning, milling, breadmaking) was investigated. Results show that washing removes a negligible amount of heavy metals; dry husking removes a significant proportion (up to half) of the heavy metal content. White flour contains approx. 40% of the heavy metal content of the whole grain, the remainder being present in the by-products (especially the bran). Spraying wheat with solutions containing $^{203}$Hg (as water-soluble compounds) resulted in significant penetration of Hg into the endosperm; this suggests that washing of grain may result in transfer of Hg from the outer layers of the grain into the endosperm. Breadmaking trials with flour labelled with $^{203}$Hg showed that up to approx. 25% of the Hg was eliminated during baking. AJDW

## 36

**[The concentrations of mercury, cadmium, lead and copper in fish and shellfish of Korea.]**
Won, J. H.
***Bulletin of the Korean Fisheries Society*** **6** (1/2) 1-19 (1973) [17 ref. Ko, en] [Pusan Fisheries Coll., Pusan, Korea]

Heavy metal concn. were determined in fishes and shellfishes sampled from Oct. 1971 to Apr. 1972 in Korea. In general, fish viscera, shellfish muscle and crustacean exoskeleton contained high concn. of the metals. Samples from the west coast of Korea contained relatively high concn. of Hg, Cu, Cd and Pb, but those from the south coast contained high levels of Cd and Pb. In particular, the concn. of Cu in samples from the west coast were almost double those of other areas. Concn. of Hg as a whole ranged 0.02-0.58 ppm with an average of 0.16 ppm. Concn. of Cd were higher in fish viscera and shellfish than muscle, ranging between <0.02 and 0.78 ppm as compared with an average of 0.12 ppm in fish and shellfish muscle. Pb concn. were fairly high in fish viscera and ranged between 0.06 and 4.84 ppm as compared with an average of 1 ppm in muscle and bone of fish and shellfish. Cu concn. were very high in the viscera of fish and shellfish and ranged between 0.12 and 28.7 ppm. Mean values in fish muscle and shellfish muscle were 1.4 and 5.9 ppm respectively. KoSFoST

## 37

**Determination of lead in organic coloring dyes by atomic absorption spectroscopy.**
Ford, A.; Young, B.; Meloan, C.
***Journal of Agricultural and Food Chemistry*** **22** (6) 1034-1036 (1974) [13 ref. En] [Dept. of Chem., Kansas St. Univ., Manhattan, Kansas 66506, USA]

A fairly rapid method has been developed for determining Pb contaminants in food colouring dyes. The sample is digested in $HNO_3$-$HClO_4$ and taken to dryness, the salts are dissolved, and a Pb-diethyldithiocarbamate chelate is formed and extracted with xylene. The Pb content is determined by atomic absorption spectroscopy. The detection limit with respect to the dyes averages about 0.4 ppm. AS

## 38

**[Determination of lead in plants and soils.]**
Cottenie, A.; Dhaese, A.
***Mededelingen van de Faculteit Landbouwwetenschappen Rijksuniversiteit Gent*** **39** (1) 301-304 (1974) [2 ref. Nl] [Fak. van de Landbouwwetenschappen, Rijksuniv., Ghent, Belgium]

The use of atomic absorption spectrophotometry for detn. of Pb in plants (including food plants) is discussed, with special reference to problems of sensitivity. Atomic absorption spectroscopy is only suitable for analysis of solutions containing ≥0.2 ppm Pb. With normal ashing and extraction methods, this gives a detection limit of 10 ppm (DM basis) in the original sample. For analysis of lower Pb concn., special ashing and extraction methods are necessary; brief details are given of 2 such methods (one based on digestion of the sample with $HNO_3$, the other based on double ashing and removal of silicates) giving detection limits of 4 ppm and 1 ppm (DM basis) respectively. AJDW

## 39

**Determination of trace metals in foods using chelating ion exchange concentration.**
Baetz, R. A.; Kenner, C. T.
***Journal of Agricultural and Food Chemistry*** **23** (1) 41-45 (1975) [25 ref. En] [FDA, Dallas District, Dallas, Texas 75204, USA]

An improved procedure based on the Baetz and Kenner multimetal method [see FSTA (1973) 5

12A536] which eliminates the necessity for the separate analysis of the neutralization precipitate is reported. The sample is digested in $HNO_3$-$H_2SO_4$-$H_2O_2$ catalysed by $V_2O_5$ and the Pb is coprecipitated with added Sr, filtered, converted to carbonate, dissolved, and determined before neutralization of the digest and column separation of the other metals. Cd, Cu, Co, Mn, Ni and Zn are eluted from the column with 2N $H_2SO_4$ and determined by atomic absorption. Sensitivity varies from 0.01 ppm for Cd to 0.1 ppm for Co and recoveries of added standards to 8 food commodities averaged 97.2%. Co recoveries are lower for certain types of foods. Values obtained by the proposed method on NBS standards 1571 (orchard leaves) and 1577 (bovine liver) agreed with the accepted correct concentrations. The heavy metal content of tomato catsup, fresh spinach, canned Bonito, apples, shredded wheat, homogenized milk, canned turnip, greens and frozen cod fillets was determined. AS

## 40

**[Possible hazard from lead as a contaminant of air, drinking water and food products.]**

Wawrzyszuk, B.; Zaborowska, W.; Witkowska, I.; Gundlach, A.; Zieminska, M.; Brzozowski, J.

***Bromatologia i Chemia Toksykologiczna*** **6** (2) 161-167 (1973) [14 ref. Pl, ru, en] [Katedra Higieny Ogolnej i Spolecznej Akad. Med., Lublin, Poland]

In an examination during 1968-1971 of different foods from Lublin (Poland) retail shops, the Public Health Laboratory or the meat factory, no Pb was detected by the dithizon method in 11 samples of milk, 1 sample of processed cheese and 6 of 7 samples of cream; the 7th sample contained traces. For other foods, the incidences of samples with none, trace, and below and above the relevant Polish Standard max. were respectively: canned meat (27 samples), 19, 2, 6 and 0; canned fish (23), 18, 3, 2 and 0; canned vegetables (13), 3, 1, 6 and 3; canned fruit (7), 3, 0, 4 and 0; wine (2), 2, 0, 0 and 0; refreshing drinks (11), 7, 0, 4 and 0; and soda water (19), 18, 0, 1 and 0. SKK

## 41

**[Effects of environmental chemicals, especially heavy metals, on the quality of food and feed plants.]** Beeinträchtigung der Qualität von Nahrungs- und Futterpflanzen durch Umweltchemikalien, insbesondere durch Schwermetalle.

Kloke, A.

***Qualitas Plantarum - Plant Foods for Human Nutrition*** **24** (1/2) 137-157 (1974) [many ref. De, en, fr] [Biol. Bundesanstalt für Land- und Forstwirtschaft, Inst. für nichtparasitäre Pflanzenkrankheiten, Königin-Luise-Str. 19, 1 Berlin (West) 33]

Aspects considered in this discussion of the effects of environmental contaminants on the quality of edible plants include: distribution of contaminants in the air; effect of environmental chemicals (e.g. $SO_2$, F, nitrogen oxides) on the yield, appearance and composition of food plants; and contamination of food plants with Pb, Hg and Cd (with special reference to sources of contamination and possible health hazards). AJDW

## 42

**Role of chronic low-level lead exposure in the aetiology of mental retardation.**

Beattie, A. D.; Moore, M. R.; Goldberg, A.; Finlayson, M. J. W.; Graham, J. F.; Mackie, E. M.; Main, J. C.; McLaren, D. A.; Murdoch, R. M.; Stewart, G. T.

***Lancet*** **1** (7907) 589-592 (1975) [17 ref. En] [Univ. Dept. of Materia Medica, Stobhill Hospital, Glasgow, UK]

Water Pb levels were measured in the homes occupied during the 1st yr of life by 77 mentally retarded children aged 2-6 yr and 77 non-retarded matched controls, and in the homes occupied by their mothers during pregnancy. The water Pb content was significantly higher in the retarded group, and the probability of mental retardation was significantly increased when water Pb exceeded 800 µg/l. Blood Pb levels were also significantly higher in the retarded group. It is concluded that Pb contamination of water may be one factor in the multifactorial aetiology of mental retardation and that every effort should be made to reduce the Pb content of drinking-water. AS

## 43

**[Effect of motor traffic on lead content of wine.]**

Basile, G.; Tarallo, V.

***Bollettino dei Laboratori Chimici Provinciali*** **25** (9) 185-188 (1974) [6 ref. It, de, en, fr] [Istituto di Chimica Agraria, Univ. di Napoli-Portiei, Naples, Italy]

The Pb content of wines produced from vineyards along roads and motorways was examined. Very high contents, exceeding the legal limit of 0.3 ppm, were obtained from vineyards alongside the Naples-Pompei motorway (0.28-0.64 mg Pb/l.), where traffic densities of 35 000 cars/day were recorded. RM

## 44

**Lead content of canned fruit.**

Thomas, B.; Edmunds, J. W.; Curry, S. J.

***Journal of the Science of Food and Agriculture*** **26** (1) 1-4 (1975) [9 ref. En] [Min. of Agric., Fisheries & Food, Plant Pathol. Lab., Hatching Green, Harpenden, Herts, UK]

The levels of Pb in samples of canned pineapples, lychees, fruit salad, loganberries, blackcurrants, cherries, apricots, pears, raspberries and tomatoes were determined. Pb content of the 168 samples was in the range 0.02 to 8.16 ppm (mean 0.94 ppm). Of the 16 samples which were above the statutory limit for Pb of 2 ppm, 12 were loganberries. The inter-can variation of Pb content ranged from 18.2% to 97.8% (mean 56.3%) and in some instances the difference between mean Pb content of different brands of the same fruit was significant. AS

## 45

**[Lead content of edible fungi.]** Bleigehalte in Pilzen.
Leh, H.-O.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **157** (3) 141-142 (1975) [5 ref. De, en] [Bundesanstalt für Land- und Forstwirtschaft, D-1000 Berlin (West) 33 (Dahlem)]

Pb contents of several var. of fresh, dried, bottled or canned edible fungi (champignons, chanterelles, boletus and mixed) were determined by photometry after dry ashing and dithizone extraction. The mean found was 0.49 ppm, with a range of 0.10-1.0 ppm. Age of the fungi had a greater influence on the Pb contents than processing; samples of 3 var. of wild edible fungi confirmed this. HBr

## 46

**Heavy metals in food products from corn.**
Garcia, W. J.; Blessin, C. W.; Inglett, G. E.
***Cereal Chemistry*** **51** (6) 779-787 (1974) [7 ref. En] [N. Regional Res. Lab., Peoria, Illinois 61604, USA]

Concn. of 7 heavy metals (Zn, Mn, Cu, Pb, Cd, Cr and Hg) were determined for a wide variety of consumer-oriented corn products: milled fractions, prepared breakfast and snack foods, canned and frozen sweet corn items, syrups, oil, and kernel popcorn. Samples were decomposed by wet-oxidation, and 6 of the elements were determined by flame atomic absorption. Hg was measured by a nonflame atomic absorption technique. Metal content ranged from >200 µg/g for Zn in a defatted corn germ flour to <0.001 µg/g for Hg in some products. The possible introduction of heavy metals into finished corn products by industrial processing was studied by comparing concn. in finished products with previously determined heavy metal concn. in whole kernel corn. AS

## 47

**Heavy metals in whole kernel dent corn determined by atomic absorption.**
Garcia, W. J.; Blessin, C. W.; Inglett, G. E.
***Cereal Chemistry*** **51** (6) 788-797 (1974) [18 ref. En] [N. Regional Res. Lab., Peoria, Illinois 61604, USA]

Whole kernel corn was wet-ashed with nitric and perchloric acids, and the resultant salts were dissolved in dilute acid. Concn. levels in corn samples were determined for Zn, Mn, Cu, Pb, Cd and Cr by flame atomic absorption. To measure the small quantities of Hg present, an oxidation procedure was developed that decomposed organic material in corn at a temp. of 70°C. The Hg was retained effectively in an aqua regia solution until the elemental Hg was de-emanated for measurement of the vapour by a nonflame atomic absorption technique. The aqua regia solution ensured that Hg was completely solubilized. In addition, Hg standards prepared in a 10% aqua regia media have proved to be stable at low concn. for extended periods. Mean concn. values for the 7 metals studied in 11 different corn samples ranged from 23 µg/g for Zn to approx. 0.0024 µg/g for Hg. AS

## 48

**[Some mineral components of cheese milk and its whey: seasonal variations.]**
Capella, P.; Losi, G.; Rastelli, R.; Lerici, C. R.
***Scienza e Tecnologia degli Alimenti*** 4 (5) 295-303 (1974) [64 ref. It, en] [Istituto di Ind. Agraria, Univ., Bologna, Italy]

10 elements - Cu, Fe, Zn, Mn, Pb, Co, Mg, Ca, K and Na were determined by atomic absorption spectrophotometry or flame photometry in 70 samples of milk and whey obtained during 1 yr from factories producing Parmesan cheese. Results, shown graphically and in tables, are generally in agreement with published data (except for Ca with 0.52-0.92 g/l., mean 0.70 g/l. milk). They confirmed that Cu, Fe, Mn and Zn are bound to the membrane of the fat globules. Some abnormal concn. were attributed to contamination from the containers. Min. and max. concn. of most elements were found in April and Oct. respectively, i.e. at the beginning and end of lactation Pb contents of both milk and whey were highest in summer (April-Sept., max. 0.90 mg/l. in milk) attributable to increased tetraethyl lead contamination of fodder. Seasonal variations in microelements suggest that they may profitably be adjusted during cheesemaking. RM

## 49

**Determination of lead in milk and butter by flameless atomic absorption.**
Velghe, G.; Verloo, M.; Cottenie, A.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **156** (2) 77-80 (1974) [11 ref. En, de] [Fac. of Agric. Sci., St. Univ., Ghent, Belgium]

Methods for determination of Pb in milk and butter by flameless atomic absorption using a 'carbon rod' technique are described. Milk samples were initially mixed with conc. $HNO_3$, evaporated to dryness and ashed, and butter samples were dissolved in petroleum benzene, treated with $HNO_3$, filtered and evaporated. Detection limit of Pb in milk and butter respectively was 0.0035 and 0.0045 ppm. In samples from 35 different factories, Pb contents ranged from 0.014 to 0.097 (mean 0.064) in milk and from 0.074 to 0.265 ppm (mean 0.138) in butter. DMK

## 50

**[Contents of heavy metals in foods. III. Heavy metals in fish and shellfish.]**
Tanaka, Y.; Ikebe, K.; Tanaka, R.; Kunita, N.
***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** **15** (5) 390-393 (1974) [6 ref. Ja] [Osaka Prefectural Inst. of Public Health, 3-69, Nakamichi 1-chome,

Higashinari-ku, Osaka, Japan]

Cd, Zn, Mn, Cu, Pb, As and total Hg were determined in a total of 105 samples representing 35 spp. of fish, crustacea and molluscs. Tables of results are given. Max. values recorded for each heavy metal were: Cd <1 ppm in all samples; Zn 272 ppm (in oysters); Mn 5.4 ppm (in shellfish); Cu 15.8 ppm (in oysters); Pb <1 ppm in all samples; As 20 ppm (sea eel); and total Hg 1.36 ppm (tunas). [See FSTA (1974) 6 9A381 for part I.]    TM

## 51

**[Quantitative determination of trace metals in frozen fish, fish oil and fish meal.]** Quantitative Bestimmung von Metallspuren in Frostfisch, Fischöl und Fischmehl.
Bugdahl, V.; Jan, E. von
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **157** (3) 133-140 (1975) [5 ref. De, en] [Unilever Forschungsgesellschaft mbH, D-2000 Hamburg 50, Federal Republic of Germany]

73 duplicate samples of the most common fish var. eaten in Federal Germany (cod, herring, red fish, saithe and tuna, caught between Dec. 1972 and Sept. 1973), 2 samples of fish oil and 2 of fish meal were analysed for contents of As (photometry), Cd and Pb (anodic stripping voltammetry) and Hg (flameless AAS). Mean contents found (ppm) for the 5 var. of fish were As 0.84, Cd 0.003, Pb 0.08 and Hg 0.06. Proposed legal max. for the metals were reached only for As (18% of the samples containing ≥0.5 ppm, the proposed limit); it is suggested that this limit for As should be raised. No correlation between fishing ground and metal content of the fish could be established. The contents of the metals found in the oil and meal showed that processing of the fish had led to no increase in the metal concn.    HBr

## 52

**Lead in pet foods and processed organ meats. A human problem?**
Hankin, L.; Heichel, G. H.; Botsford, R. A.
***Journal of the American Medical Association*** **231** (5) 484-485 (1975) [10 ref. En] [Connecticut Agric. Expt. Sta., Box 1106, New Haven, Connecticut 06504, USA]

Brief details are given of studies on the Pb content of 7 samples of liverwurst, 1 sample of canned liver spread and 20 samples of canned pet food (it is alleged that pet foods are sometimes used for human consumption). Ranges of values for Pb concn. were (ppm): liverwurst 1.8-7.6; liver spread 1.6 (one value); and pet foods 0.9-5.6. In a second investigation, 14 further liverwurst samples were found to be free from Pb. The significance of liver products as a source of dietary Pb is briefly discussed.    AJDW

## 53

**Silver-plated hollowware.**
**United States of America**, Food & Drug Administration
***Federal Register*** **40** (30, Feb. 12) 6523-6524 (1975) [En] [Washington, DC, USA]

Analysis of 90 different silver-plate articles including baby cups, tankards, coffee sets, tea sets, goblets, salad bowls, gravy bowls, and serving trays show leachable Pb values of 0-316 ppm Pb in the leaching solution. Apparent sources of Pb are the base metals, spouts and fluxes. Repeated use by infants and children of cups, bowls, etc. which leach the high Pb levels would pose a chronic health hazard.    CAS

## 54

**[Reference methods for determination of some metals. I. Lead.]**
Chojnicka-Brzozowska, B.; Sokolowska, R.
***Roczniki Panstwowego Zakladu Higieny*** **26** (1) 65-80 (1975) [25 ref. Pl, ru, en] [Panstwowy Zaklad Higieny, Warsaw, Poland]

The Polish standard [PN-59/A-04011] dithizone method, the atomic absorption spectrophotometry (AAS) method proposed by the FAO/WHO Food Codex Committee [Document CX/MAS/70/C/2] and the dithizone method of the International Organization for Standardization [Document ISO/TC-34/SC-7/WG-2/Secr 2/2E (1967)] were studied for suitability as standard reference methods of Pb determination; tomato concentrate, dried milk and canned fish were used as test substances, and several variants of ashing were tried out. No particular advantages of either dithizone method over the other were found, and it is suggested that the Polish standard method with wet ashing be retained with some unspecified modification. It was found that the AAS method with wet ashing in the presence of $SrCl_2$ is unsuitable for milk and that its adoption for other foods requires further study.    SKK

## 55

**[Uptake of metals by canned foods.]** Überblick über die Metallaufnahme des Füllgutes in Konservendosen. [Review]
Kolb, H.
***Deutsche Lebensmittel-Rundschau*** **71** (3) 105-111 (1975) [55 ref. De] [Inst. für Lebensmitteltech. und Verpackung, Tech. Univ., Munich, Federal Republic of Germany]

Aspects considered in this review include: effects of pH, storage time, storage temp. and the composition of the food on corrosion of cans; factors influencing uptake of individual metals (Sn, Fe, Zn, Cr, Al, Pb) by canned foods; effects of uptake of metals on the quality of foods; toxicological aspects; and methods for minimization of uptake of metals by canned foods.    AJDW

## 56

**Metals and foods.**
Whitman, W. E.
***Food Progress*** **2** (11) 1-2 (1975) [En]

Interactions between structural materials used in food manufacturing plants, foodstuffs and cleansing agents, and the likelihood of their causing food poisoning or food off-flavours are discussed. As, Pb, Hg, Cd and Zn may cause food poisoning, whilst metals such as Cu (even at 0.1 ppm), Ni, Fe and Cr may catalyse oxidation reactions and cause off-flavours. Al is suitable for use in food plant construction, but not for long-term storage of acid products. CDP

## 57

**[Determination of lead and copper in mains water in Poznan province.]**
Tifenbach, A.; Sobczak, W.
***Roczniki Panstwowego Zakladu Higieny*** **26** (1) 35-38 (1975) [5 ref. Pl, ru, en] [Wojewodzka Sta. San-Epid., Poznan, Poland]

128 samples of water from 27 towns in the Polish province of Poznan were analysed by photocolorimetry for contents of Cu and Pb. Contents found ranged from 0.02 to 0.50 mg/dm$^3$ Cu and from 0 to 0.240 mg/dm$^3$ Pb. These are within the legal limits. HBr

## 58

**[Determination of lead in wines and juices by flameless atomic absorption.]** Bestimmung von Blei in Wein und Säften mit flammenloser Atomabsorption.
Mack, D.
***Deutsche Lebensmittel-Rundschau*** **71** (2) 71-72 (1975) [5 ref. De, en, fr] [Chem. Landesuntersuchungsanstalt, Stuttgart, Federal Republic of Germany]

A rapid atomic absorption spectrophotometric method for detn. of Pb in wines and fruit juices is described, based on ashing and vaporization of the sample (without preliminary drying or ashing) in an electrically heated graphite crucible in the atomic absorption spectrophotometer. 41 samples of wine (mainly German-produced) were analysed by this method; Pb concn. $\leq$0.15 ppm were detected (mean 0.09 ppm). 7 Italian wines contained 0.2-0.4 ppm Pb. 12 samples of cherry juice contained approx. 0.01 ppm Pb. Canned orange and grapefruit juices contained $\leq$0.3 ppm Pb; bottled samples contained 0.01-0.02 ppm. The Pb concn. in mashes prepared from grapes grown near a Pb-processing factory depended on the distance of the vine from the factory (e.g. 0.25 ppm for grapes grown 200 m from the factory, 0.05 ppm for those grown 700 m from the factory). AJDW

## 59

**Atomic-absorption spectrophotometric determination of lead in beverages and fruit juices and of lead extracted by their action on glazed ceramic surfaces.**
Gegiou, D.; Botsivali, M.
***Analyst*** **100** (1189) 234-237 (1975) [7 ref. En] [Res. Dept., St. Chem. Lab., 16 A Tsoha Street., Athens, Greece]

A rapid procedure for detn. of Pb in beverages and citrus fruit juices by directly aspirating them into an atomic-absorption spectrophotometer is described. Pb concn. down to 0.1 ppm can easily be determined; SD in the range 0.5-2.0 ppm Pb is about 0.04 ppm. Accuracy of the method is good, sensitivity is slightly lower than with methods involving condensation procedures, but it is simpler and more rapid. The method was applied to samples of orange juice, coffee infusion, tea infusion and dry wine kept. for 0.5 h in glazed ceramic cups previously checked for leachable Pb by 4% acetic acid solution, the reagent used for testing ceramic ware for extractable Pb. The Pb content in these beverages was about 1.5 ppm. The recommended FDA limit for leachable Pb in ceramic ware is 7 ppm, and British Standards limits for Pb are 0.2 ppm in non-alcoholic beverages, 0.5 ppm in fruit juices, and 1.0 ppm in wines. AL

## 60

**An appraisal of toxic metal residue in the soils of a disused sewage farm.**
Pike, E. R.; Graham, L. C.; Fogden, M. W.
***Journal of the Association of Public Analysts*** **13** (1) 19-33 (1975) [21 ref. En] [County of Leicester Public Analyst's Lab., Fillingate, Wanlip, Leicester, UK]

The toxic metals (Zn, Cu, Ni, Pb, Cd, As and Cr) in the soils of disused sewage farm were determined and consideration given to any toxic hazard likely to be encountered during the building of a proposed satellite town on the site. Uptake of the Zn, Cu and Ni by vegetables (lettuce, radishes, cabbages, savoys, cauliflowers, potatoes, carrots, sprouts, tomatoes and beans) grown on the sewage farm soil was investigated. Results were: Zn - all vegetables satisfied the usually accepted max. Zn content of 50 ppm, but lettuce and radish tended to accumulate Zn when grown in soils of high Zn content; Cu -level in the vegetables did not approach the max. level of 20 ppm and there was no preferential uptake on Cu-rich soils; and Ni - no vegetable exceeded the 50 ppm level suggested by Monier-Williams. VJG

### 61

**The concentration of mercury, copper, nickel, silver, cadmium, and lead in the northern Adriatic anchovy, Engraulis encrasicholus, and sardine, Sardina pilchardus.**
Gilmartin, M.; Revelante, N.
***Fishery Bulletin, National Oceanic and Atmospheric Administration*** **73** (1) 193-201 (1975) [37 ref. En] [Australian Inst. of Marine Sci., PO Box 1104, Townsville, Queensland 4810, Australia]

Levels of Hg, Cu, Ni, Ag, Cd and Pb were determined in various tissues of the northern Adriatic anchovy, Engraulis encrasicholus, and sardine, Sardina pilchardus, throughout a 7 month fishing season. The highest concn. of Ni, Ag, Cd and Pb occurred in the skin and gills, with little interspecific difference and no unusually high values. The highest concn. of Hg and Cu occurred in internal tissues, with the anchovy showing markedly higher concn. than the sardine. Total Hg concn. in anchovy muscle were 70-215 ng/g wet wt., 2-4 times greater than in the same or similar anchovy spp. of northwestern Africa, southeastern USA and California. AS

### 62

**[Emissions and food quality.]** Immissionen und Nahrungsqualität. [Lecture]
Vetter, H.; Früchtenicht, K.; Mählhop, R.
***Landwirtschaftliche Forschung*** **30** (Sonderheft I) 29-39 (1973) [De] [Mars-laTour-Strasse 4, 29 Oldenburg, Federal Republic of Germany]

Concn. of toxic components from air pollution in soils and plant and animal foods was investigated. 300 samples of food were analysed for Zn, Pb, Cu and Cd as follows: 12 kinds of fruits and vegetables up to 3 km from the source of emission, cereals up to 15 km, fish up to 7.5 km, meat and milk up to 15 km. Mean Zn concn. of all foods were 40% higher than normal and Cu concn. were reduced, probably through competition by Cd during absorption. At 2 km, mean Cd concn. increased 7-fold, Pb concn. 11-fold, especially in liver (19-fold) and kidney (25-fold), less in milk (3-fold) and meat (5-fold). RM

### 63

**[Lead pollution of the atmosphere.]**
Cosentino, C.
***Industrie Alimentari*** **14** (2) 53-57 (1975) [6 ref. It] [Lab. Chimico Provinciale, Catanzaro, Italy]

Samples of forage crops, vegetables and fruit grown near major roads and motorways in Italy and samples of soil from the same areas were dried, ashed and treated with conc. HCl and conc. $HNO_3$. The Pb content of the samples was determined by spectrophotometry. Tabulated results show that the plants contained 0-10.13 ppm Pb. Soil contained 9-16 ppm. Average Pb content of 32 samples of soils and plants was 2.49 ppm. It is concluded that the Pb content of fruits and vegetables grown in the vinicity of heavy traffic, although not high enough to cause acute poisoning in humans, might be sufficient to induce chronic poisoning. CR

### 64

**[Investigation of harmful trace elements in food.]**
Ko, I. S.; Ro, C. B.; Song, C.; Kwon, H. H.; Kim, K. S.; Yun, K. B.; Yoo, B. C.
***Report of the National Institute of Health*** **10**, 437-453 (1973) [42 ref. Ko, en] [Coll. of Pharmacy, Kyung Hee Univ., Seoul, Korea]

Trace elements, including Cu, Pb, Cd, Mn and Zn were determined in foods collected from various locations in Korea. [See FSTA (1974) **6** 3C87 for previous part.] KoSFoST

### 65

**Comparison of three atomic absorption techniques for determining metals in soybean oil.**
Black, L. T.
***Journal of the American Oil Chemists' Society*** **52** (3) 88-91 (1975) [17 ref. En] [N. Regional Res. Lab., Peoria, Illinois 61604, USA]

3 different atomic absorption techniques were used to analyse metals contained in 3 different crude soybean oils. In the first, oil was decomposed by charring followed by high-temp. dry ashing. The ash then was dissolved in a dil. acidic aqueous medium. In the second, oil diluted with methyl isobutyl ketone as the solvent was aspirated directly. In the third, the original oil sample was ashed and the metal atomized in a sequential process by a carbon rod furnace. This third technique required only µl quantities of an oil. The analysis for many metals was similar regardless of the technique. However, values obtained for Zn, Ca, Cr, Pb and Ca were extremely dependent upon the technique used. AS

### 66

**[Use of neutron activation and atomic absorption to study certain heavy metals in the fodder-dairy products chain.]** (In "Comparative studies of food and environmental contamination. Proceedings of a symposium on nuclear techniques in comparative studies of food and environmental contamination, held in Otaniemi, Finland, 27-31 August, 1973".) [Conference proceedings]
Bruant, C.; Bruant, J.-P.; Neuburger, M.; Fourcy, A.
pp. 293-307 (1974) [8 ref. Fr, en] Vienna, Austria; International Atomic Energy Agency [Centre d'Etudes Nucleaires de Grenoble, France]

Neutron activation methods for the measurement of Cu, Hg and Zn and atomic absorption methods for measuring Pb and Cd were used to estimate these metals in hay, maize, oilcake, feed concentrates, mineral supplements and drinking water given to dairy cows, and in the resulting milk and milk products. Drinking water contained (µg/l.): Hg, 0.11-0.63; Cu, 20-600; Zn, 150-1900; Pb, 2.5-23; and Cd, ≤1. The feedstuffs (excluding the mineral supplement) contained (µg/g): Hg, 0.005-0.019; Cu, 4.8-24.5; Zn, 16.1-55.5; Pb, 0.80-4.48; and Cd, 0.29-0.72. Compared with the high metal intake, the coutput in the milk was low. The milk contained (µg/g non-desiccated crude matter): Hg, 0.0019 ± 0.0011; Cu, 0.87 ± 0.30; Zn, 5.8 ± 2.6; Pb, 0.18 ± 0.20; and Cd (µg/g fresh material), 0.08-0.29. During cheesemaking there was a concentration of the metals resulting in the following levels (µg/g) in Camembert and Gruyere cheeses respectively: Hg, 0.054 and 0.063; Cu, 4.68 and 47.16; Zn, 27.7 and 33.2; Cd 0.17-0.50 and 0.18-0.25. Levels of Pb were too low for accurate estimation. The high level of Cu in the Gruyere cheese was due to the use of Cu utensils. MEG

## 67

**The levels of heavy metals (Mn, Fe, Co, Ni, Cu, Zn, Cd, Pb, Hg) in fish from onshore and offshore waters of the German Bight.**
Harms, U.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 157** (3) 125-132 (1975) [12 ref. En, de] [Bundesforschungsanstalt für Fischerei, Hamburg, Federal Republic of Germany]

During the period Oct. 1972-March 1974, muscle samples from cod and plaice caught in different regions of the German Bight were analysed for heavy metals using atomic absorption spectrophotometry. Each sample consisted of a homogenate of 10 fillets. Details of the methods of analysis are given. The ranges of values found were: Zn, 2.0-7.5 ppm; Fe, 0.3-3.0 ppm; Cu, 0.2-1.0 ppm; Mn, 0.03-0.2 ppm; Co, 5-15 ppb and Ni, 20-100 ppb. No significant differences between the levels of these metals in cod and plaice muscle or in onshore or offshore waters were found. Cd levels in offshore fish were <20 ppb with 50% of the values between 3 and 8 ppb, whereas plaice from coastal fishing areas (especially in the vicinity of the river Elbe) sometimes contained Cd levels of up to 70 ppb. The Pb and Hg contents of offshore fish muscle were <0.1 and <0.14 ppm respectively but plaice from onshore waters contained 0.08-0.2 ppm Pb and up to 0.35 ppm Hg. The results indicate that river pollution is one of the main sources of metals in fish muscle. MEG

## 68

**[The danger of accumulation of lead in domestic animals fed hay from fields near main roads in Norway.]**
Froslie, A.; Holt, G.; Norheim, G.
***Nordisk Veterinaermedicin* 27** (3) 173-180 (1975) [23 ref. No, en] [Veterinaerinst., Postboks 8156, Oslo-Dep., Oslo 1, Norway]

4 sheep ( 6 months old at the start of the experiment) were fed for 5 months on hay (mean Pb content 4.6 µg/g) from fields beside a main road near Sande, Norway. At the end of the 5-month experimental period the sheep were slaughtered together with a control group of 9 animals, and Pb concn. were determined by atomic absorption in liver, kidney, blood, muscle tissue, and bones (ribs and femur/humerus). Tables of results are given. No significant effect of feeding Pb-contaminated hay on Pb concn. in the tissues was observed. Bone tissue from a total of 9 cattle (6 adults, 3 calves) which had grazed throughout their lives near the main road also showed Pb concn. within the normal range. The possible use of measurement of δ-aminolevulinic acid dehydrogenase activity in the blood as a test for subclinical Pb poisoning is briefly discussed. AJDW

## 69

**[Study of trace elements in foods. VIII. Simultaneous determination of lead and arsenic.]**
Osajima, Y.; Sakane, Y.; Akuta, S.
***Science Bulletin of the Faculty of Agriculture, Kyushu University* 29** (4) 173-178 (1974) [Ja, en] [Lab. of Food Analysis, Fac. of Agric., Kyushu Univ., Fukuoka, Japan]

A method is described for simultaneous detn. of Pb and As by atomic absorption spectrophotometry. Recovery from citrus juice was 98.8% for Pb and 73.3% for As; error of the method is 1.42% for Pb and 2.0% for As. [From En summ.] AL

## 70

**[Studies on toxic pesticide residues in foods. VI.]**
Ro, C. B.; Song, C.; Sheen, K. S.; Kim, K. S.; Lee, H. J.; Won, K. P.; Shim, H. S.
***Report of the National Institute of Health* 10**, 257-268 (1973) [18 ref. Ko, en] [Dept. of Hygiene, Nat. Inst. of Health, Seoul, Korea]

14 types of agricultural produce collected from 6 locations in Korea were subjected to analysis for As, Cu, Hg, Pb, BHC, heptachlor, heptachlor epoxide, endrin, aldrin, dieldrin and DDT. [See FSTA (1974) **6** 3C89 for previous part.] KoSFoST

## 71

**Lead exposure and its significance.**
Anon.
***Food and Cosmetics Toxicology* 13** (2) 277-282 (1975) [39 ref. En]

Aspects covered include: normal Pb intake by children; estimation of the body burden of Pb; sources of Pb exposure; and toxicological significance of high blood-Pb levels. VJG

## 72

**[Pollution in the neighbourhood of a lead and zinc works.]** Immissionsstoffbelastung in der Nachbarschaft einer Blei- und Zinkhütte.
Vetter, H.; Mählhop, R.; Früchtenicht, K.
***Berichte über Landwirtschaft* 52** (2) 327-350 (1974) [6 ref. De, en, fr]

An extensive survey carried out in 1972 and 1973 of environmental and food pollution with Pb, Zn and Cd in an area within a 12-km radius of an industrial centre in Lower Saxony containing Pb and Zn works and a fertilizer plant. Sampling was carried out at 1, 2, 3, 6, 9 and 12 km from the centre. Data for Pb and Cd contents of several hundred samples of foods of animal origin are graphically presented. Most milk samples contained

0.02-0.04 mg Pb/l., and none exceeded a content of 0.2 mg/l. For Cd, the values were around 0.02 mg/l. Pb and Cd contents were particularly high in rabbit and beef liver and kidneys; meat contained much less. Values for Pb, Zn, Cd and Cu contents are tabulated for 18 kinds of prepared vegetable and fruit and for 14 not prepared. Calculated weekly intakes of Pb and Cd/person from milk, butter, fat and cheese, meat, liver, fish, and several vegetables and fruit are tabulated for 1, 2 and 3 km distances from the centre. It is considered that within distances of ≤2.5 km, the WHO permissible Pb and Cd ingestion would be exceeded by persons eating a customary diet. SKK

## 73

**[Studies of lead and cadmium in crockery.]** Untersuchungen über die Blei- und Cadmiumabgabe in Geschirren.
Hegersweiler, P.
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** 66 (1) 58-63 (1975) [De, fr] [Kantonales Lab., CH-4056 Basel, Switzerland]

Experiments and findings of the [Swiss] Working Party on Pb tolerances for Crockery charged with revision of Article 453 of the Food Regulations are briefly reported. Article 453 demands that those parts of enamelled, lacquered or glazed vessels and crockery liable to come in contact with foods or the mouth of the consumer should not release in 24-h treatment with 4% acetic acid ≥3 mg Pb/100 $cm^2$ surface. The recommendations of the Party on max. contents of Pb and Cd, respectively, in vessels and crockery are (mg/100 $cm^2$ surface): inside of vessels and topside of plates, 0.5 and 0.05; rim of all drinking vessels coming in contact with lips in a width of ≥2 cm, 1.0 and 0.10; and total outer surfaces, 20.0 and 2.0. SKK

## 74

**Problems associated with corrosion of containers used for canned foods.**
Page, G. G.; Hughes, J. T.; Wilson, P. T.
***Food Technology in New Zealand*** 9 (11) 19-21, 23-25 (1974) [56 ref. En] [Chem. Div., DSIR, Lower Hutt, New Zealand]

The electrochemical principles which allow either lacquered or plain tin-plate to be used as a food packaging material are reviewed. The series of steps involved in the manufacture of a tin can are described. The results of a survey carried out in July 1973 on 189 samples (fruit juices and beverages, main course baby foods, baby food puddings, vegetables, fruit products, sauces and concentrates, jams, hors d'oeuvres, main course and soups) purchased from food shops in different parts of Wellington are reported. Can finishes were: 45 unlacquered, 53 end-lacquered and 91 fully lacquered. An analysis of the results revealed that the incidence of Pb contamination is significant and is mainly associated with lacquered cans. The source of this contamination is identified and steps which may be taken to rectify this situation are discussed. VJG

## 75

**[Importance of environmental contamination with lead for man and animals.]** Bedeutung der Umweltkontamination mit Blei für Mensch und Tier. [Review]
Schlatter, C.
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** 66 (1) 51-57 (1975) [32 ref. De, fr, en] [Vet.-Physiol. Inst., Univ., CH-8054 Zürich, Switzerland]

This review article includes some literature data on Pb contents in foods of animal and vegetable origin, drinking water, acid beverages in faulty pottery vessels, as well as in can contents. SKK

## 76

**[Determination of heavy metals in foods by inverse polarography. I. Determination of lead, copper and cadmium.]** Die Bestimmung von Schwermetallspuren in Lebensmitteln mit Hilfe der Inverspolarographie. I. Die Bestimmung von Blei, Cadmium und Kupfer.
Collet, P.
***Deutsche Lebensmittel-Rundschau*** 71 (7) 249-253 (1975) [6 ref. De, en, fr] [Chem. Untersuchungsamt für das Saarland, Federal Republic of Germany]

A method for detn. of Pb, Cd and Cu in foods by inverse polarography is described; samples are digested by heating with $H_2SO_4 + H_2O_2$ before analysis. Sn interferes with detn. of Pb but may be separated as tin (IV) iodide by heating of the digested sample with $NH_4I$. Detection limits for the 3 metals studied were (ng/ml): Cu 6; Cd 0.25; and Pb 2.6. Reproducibility studies on model solutions showed SD of 2-10% depending on concn. Data (mean values and ranges) are given for the Pb, Cu and Cd concn. in 298 samples of various foods (meat and meat products, canned foods, alcoholic beverages, fresh vegetables, fresh fruit, cereal products, ice cream and dried soups). AJDW

## 77

**[Lead and copper in Ciro wine and wines of the Lametino region.]**
Mauro, A.
***Industrie delle Bevande*** 4 (2) 81-84 (1975) [9 ref. It] [Lab. Chim. Prov. IP, Catanzaro, Italy]

Ranges for Pb and Cu contents of 37 samples of Ciro wine were 0.02-0.776 ppm and 0.08-0.74 ppm, respectively. Corresponding values for 30 samples of Lamezia Terme wine were 0.01-0.2 and 0.025-0.72 ppm. SKK

## 78

**[Metals and plastics materials in milk.]**
Anon.
***Revue de la Conserve Alimentation Moderne*** No. 27, 97-99 (1974) [Fr]

This article summarizes the levels of metals normally found in milk (e.g. 0.15-0.97 ppm Al, 0.1-0.4 ppm Cu, 0.14 ppm F, 0.28 ppm I, 0.6-1.2 ppm Fe, 0.07 ppm Mo, 3.8 ppm Zn), and briefly outlines conditions which may lead to unacceptably high metal contents, particularly of Pb, Hg, As and Cu. The occurrence of off-flavours in milk and dairy products stored in containers or films of polyethylene, polypropylene, PVC, polystyrene or polyvinyl acetate is also mentioned briefly. MEG

## 79

**Trace metals and protein in California market milk.** [Lecture]

Bruhn, J. C.; Franke, A. A.

***Journal of Dairy Science*** **58** (5) 788 (1975) [En] [Univ. of California, Davis, California, USA]

In samples of market skim-, low-fat, regular and extra rich milks, mean concn. of Cu, Pb, Cd and Se respectively were (ppm): 0.042 ± 0.02; 0.07 ± 0.062; 0.054 ± 0.048; and 0.024. Mean concn. of Zn in the 4 milk products respectively were 3.9, 4.2, 3.6 and 3.8 ppm, and corresponding protein concn. were 3.7, 3.8, 3.3 and 3.4%. [See 7 11P2324.] DMK

## 80

**Lead concentrations in native trout.**

Pagenkopf, G. K.; Neuman, D. R.

***Bulletin of Environmental Contamination and Toxicology*** **12** (1) 70-75 (1974) [17 ref. En] [Dept. of Chem., Montana St. Univ., Bozeman, Montana 59715, USA]

Pb concn. in native trout in (i) the West Gallatin river (Pb content of the water 2.81 ng/ml), which flows adjacent to a main traffic highway for 40 miles, was compared with values for fish from (ii) the Federal fish hatchery (Pb content of the water 1.41 ng/ml) and from (iii) the river headwaters in Yellowstone National Park. Results showed significantly higher mean Pb concn. in fish from (i) than fish from (ii); comparisons of (i) and (iii) showed no significant difference in gill and liver tissue, but a slightly higher value in bones of fish from (i) than in bones of fish from (iii). AL

## 81

**Pesticide residues in total diet samples. VII.**

Manske, D. D.; Corneliussen, P. E.

***Pesticides Monitoring Journal*** **8** (2) 110-124 (1974) [13 ref. En] [Kansas City Field Office Lab., FDA, US Dept. of Health, Education & Welfare, Kansas City, Missouri 64106, USA]

A total of 360 composite samples of 12 classes of foods (dairy products; meat, fish and poultry; grain and cereal products; potatoes; leafy vegetables; legumes; root vegetables; garden fruit; other fruit; oils, fats and shortenings; sugars and adjuncts; and beverages) collected in 30 markets in 27 cities in the USA during the period June 1970-April 1971 were analysed for a total of 33 toxic substances (pesticides, polychlorinated biphenyls and heavy metals). Detailed tables of results are given, broken down by product type, residue type and region. [See Pesticides Monitoring Journal (1972) 5 (4) 313-330 for part VI.] AJDW

## 82

**Extraction of heavy metals from plastic food containers: an X-ray fluorescence and atomic absorption study.**

Meranger, J. C.; Cunningham, H. M.; Giroux, A.

***Canadian Journal of Public Health*** **65** (4) 292-296 (1974) [11 ref. En, fr] [Health Protection Branch, Food Res. Lab., Health & Welfare Canada, Food & Drug Building, Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada]

X-ray fluorescence scanning of 62 plastics food containers purchased in local supermarkets revealed the presence of the following elements: Ba, Bi, Br, Cd, Cu, Fe, Hg, Ni, Pb, Se, Sr, and Zn. The amount of metal leachable by simulated food solvents was determined by atomic absorption spectrophotometry on all Cd, Hg, and Pb-containing plastics. No extractable Pb levels were found, while Hg was extracted at levels up to 0.02 μg/cm$^2$. Traces of Cd from 0.002 to 0.020 μg/cm$^2$ were found in all but 2 samples. UV irradiation and surface abrasion increased this max. amount to 0.049 and 0.034 μg/cm$^2$ respectively, while scrapings of the same plastics were more soluble (0.45 μg/cm$^2$). The amount of Cd leached by 0.1 N HCl from these same scrapings (0.266 μg/cm$^2$) indicated that Cd could be dissolved from the ingestion of small pieces of plastics material. AS

## 83

**[Estimation of microamounts of Pb and Zn in raw materials and canned food with dithizon.]**

Mikhailova, N. V.; Sobol'eva, E. I.; Burtnenko, T. I.; Litvinova, V. D.; Radomskaya, L. G.

***Konservnaya i Ovoshchesushil'naya Promyshlennost'*** No. 12, 31-32 (1974) [2 ref. Ru] [Ukrainskii Nauchno-issled. Inst. Konservnoi Promyshlennosti, USSR]

A method of establishing Pb and Zn content of vegetables and canned vegetables was developed in the Ukrainian Research Institute of Food Preservation. The method is based on Pb and Zn separation using a chloroform solution of dithizon (D). Firstly, Cu as a copper dithizonate is removed at pH 2 and then a mixture of lead and zinc dithizonates is formed in an ammonia medium at pH 8.5-9.0. Pb is extracted with a 10% solution of $Na_2S_2O_3$ at pH 5.5-6.0 and measured by dithizone titration using visual colorimetry. Following extraction with N HCl, Zn is measured by a complexometric titration with trilon B (ethylenediaminotetraacetic acid) and chromogen black ET-OO indicator. A detailed description of the analysis is presented for 30-50 g of vegetables or 10 g of canned vegetables. Mineralization takes place followed by an addition of 0.5 g of $NH_4HCO_3$. The method detects 1 μg of Pb and 10 μg of Zn in the above amount of vegetables, i.e. 0.1 mg Pb and 1 mg Zn/kg of product. The mean relative error is about 5%. The analysis takes about 2.5-3 h. STI

84

**Arsenic and lead content of expressed Florida grapefruit oil as related to cultural sprays.**
Kesterson, J. W.; Braddock, R. J.; Koo, R. C. J.; Reese, R. L.
***HortScience*** **10** (1) 65-66 (1975) [5 ref. En]
[Agric. Res. & Education Center, Univ. of Florida, Lake Alfred, Florida, USA]

Grapefruit is the only citrus fruit according to Florida law that can be legally sprayed with lead arsenate [$Pb_3(AsO_4)_2$], in order to accelerate fruit maturation. The effect of various maturation sprays as related to these trace metals was studied since definite tolerances for Pb and As have been established for citrus oils. It was found that As and Pb sprays applied to grapefruit (Citrus paradisi Macfad.) accelerate fruit maturity but do not contribute to the As and Pb content of the peel oil. The physicochemical properties of the expressed oils are influenced by this induced maturity but these changes would occur naturally during normal fruit maturation. AA

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FAB 28

# CONTENT AND ANALYSIS OF LEAD IN FOODS

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H. BROOKES

ASSISTANT EDITOR

## 1

**Determination of heavy metals in foods by anodic stripping voltammetry after sample decomposition with sodium and potassium nitrate fusion.**
Holak, W.
***Journal of the Association of Official Analytical Chemists*** **58** (4) 777-780 (1975) [6 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

A method is described for the simultaneous detn. of several heavy metals in foods. The sample is predigested with $HNO_3$ and decomposed completely by heating with a mixture of sodium and potassium nitrates. The resultant melt containing the metals is then disolved in dilute $HNO_3$. After the pH is adjusted to an appropriate value, the metals, such as Cd, Cu, Pb, and Zn, are determined by anodic stripping voltammetry. The average recoveries of these metals added to 5 commodities were 98, 98, 96 and 104%, respectively. The relative SD, based on data from analyses of a commodity containing measurable levels of Cu, Pb and Zn, were 12.0, 13.0 and 9.7%, respectively. AS

## 2

**[Cadmium, lead and zinc contents of fruits and vegetables from gardens in an industrial region.]**
Cadmium-, Blei und Zinkgehalt pflanzlicher Lebensmittel aus Kleingärten eines Industriegebiets.
Pfeilsticker, K.; Markard, C.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **158** (3) 129-135 (1975) [21 ref. De, en] [Lehrstuhl für Lebensmittelwissenschaft, Univ., Bonn, Federal Republic of Germany]

Cd, Pb and Zn contents of 3 samples of milk obtained in 1973 in Dortmund (Federal Republic of Germany) and of a total of 136 samples of fruit and vegetables from Dortmund gardens were determined by AAS. Methods and procedure are described in detail. Geometric means with ranges (ppm) of milk were 0.024 (0.01-0.076), 0.197 (0.11-0.266) and 6.79 (4.81-10.01), respectively, for Cd, Pb and Zn. Fruit and vegetable samples were from 21 sites in the industrial regions, distances of the sites from relevant potentially contaminating factories being diagrammatically shown. Values are tabulated as for milk for 2-14 samples each of 12 var. of vegetable and 8 var. of fruit. 5% of all samples exceeded the proposed max. limit of 0.1 ppm for Cd (among them parsley, lettuce, lamb's lettuce and redcurrant samples, max. content of 0.2 ppm being in lamb's lettuce; 13% exceeded the proposed max. limit of 0.8 ppm for Pb (among them rhubard, lamb's lettuce, redcurrant, blackcurrant and gooseberry samples, max. content of 9.1 ppm being in rhubarb); and 13% exceeded the proposed max. limit of 10 ppm for Zn (among them parsley, lettuce, lamb's lettuce, spinach and gooseberry, max. content of 26.7 ppm being in parsley). SKK

## 3

**Lead: the relation of environment and experimental work.**
Clayton, B. E.
***British Medical Bulletin*** **31** (3) 236-240 (1975) [65 ref. En] [Hospital for Sick Children, London, UK]

Aspects considered in this review on environmental exposure to Pb (including Pb in foods and drinking water) include: intake of Pb from foods and beverages; absorption of Pb in the alimentary tract; effects of Pb intake on the activity of various enzymes; relation of Pb intake to mental development; effects of Pb on the foetus; and Pb in soil, water and air. AJDW

## 4

**The effect of some heavy metals on oats in a pot experiment with three different soil types.**
Sorteberg, A.
***Journal of the Scientific Agricultural Society of Finland*** **46** (3) 277-288 (1974) [15 ref. En, fi] [Dept. of Soil Fertility & Management, Agric. Univ. of Norway, Norway]

The effects of 5 heavy metals (Cd, Co, Pb, Hg and Ni) on yield and heavy metal contents of oats were determined. The heavy metals were applied at concn. of (i) 0.5 and (ii) 250 mg/pot combined with liming at each of 2 concn. on clay, peat and sandy soils. Tabulated data are given. Apart from Pb, the heavy metal content of the oats increased with increased metal application. The heavy metal content in crops from peat and sandy soil was greater than in crops grown on clay soil. The Cd, Ni and Co contents were lower with heavy liming than with light liming, particularly in crops from clay and sandy soils. Liming had equivocal effects on Hg and Pb uptake. GL

## 5

**[Charting of lead and cadmium contents of Swedish market milk.]**
Jonsson, H.
***Nordisk Mejeriindustri*** **2** (2) 58-59, 61 (1975) [13 ref. Sv]

Cd content of 98 samples of 3%-fat market milk from 10 dairies in different parts of Sweden (1974) was <0.2 µg/l. in all cases. Pb content averaged 2.01 µg/l. with SD of 0.49. On the basis of daily per caput milk consumption of 0.5 l., it is estimated that weekly intake via milk is 7 µg Pb and <0.7 µg/Cd, well below the max. recommended by WHO. ADL

## 6

**[Migration of some metal ions in canned gooseberries.]**
Nalepa, W.; Cichon, Z.
***Opakowanie*** **21** (4) 19-20 (1975) [4 ref. Pl, en, ru]

Tests were performed to establish the migration rate of some metal ions including As, Pb, Cu, Zn, Fe and Sn into the liquid part of the can contents; only the 1st stage of migration was studied. The gooseberry cans were made of white metal sheet, lacquered and non-lacquered. The lacquered cans were given ≥1 coat. Migration of the metal ions was slower in the lacquered cans than in the unlacquered cans. STI

## 7

**An investigation of heavy metal contamination of drinking water in the city of Trondheim, Norway.**
Stegavik, K.
***Bulletin of Environmental Contamination and Toxicology*** **14** (1) 57-60 (1975) [1 ref. En] [Inst of Physics, Univ. of Trondheim, 7000 Trondheim, Norway]

A total of approx. 600 samples of (i) cold water stored in the tap for several h, (ii) running cold water, and (iii) hot water from the hot water heater was obtained from houses and flats in Trondheim. The samples were analysed for Zn, Cd, Cu and Pb by flameless atomic absorption spectrophotometry. Taps were found to the main source of Zn and Cd, and water heaters the main source of Pb. Generally, concn. were very small and constitute no reason for concern regarding public health implications. Mean levels found (parts/billion) in (i), (ii) and (iii), respectively, were: Zn, 348, 126 and 130; Cu, 164, 52 and 209; Pb, 9.7, 2.7 and 21; Cd, no mean levels given. Max. concn. (parts/billion) found were: Zn, 2125; Cd, 8.6; Cu, 1100; and Pb, 110. JRR

## 8

**[Pb in wines.]**
Biscardi, D.; Fusco, R. de; Parrella, A.
***Nuovi Annali d'Igiene e Microbiologia*** **25** (6) 381-389 (1974) [24 ref. It, en] [Cattedra di Igiene, Fac. di Sci., Univ. di Napoli, Naples, Italy]

Pb was determined by atomic absorption spectrometry in 100 samples of Italian wine (34 white, 66 red) of which 15 were manufactured and bottled in industrial-scale plants and 85 were made and bottled by artisanal or small cooperative winemaking plants. A table of results is given. White wines contained ≤1.23 ppm Pb; red wines contained ≤1.10 ppm Pb. Wines manufactured and bottled in industrial-scale plants tended to have the highest Pb concn. 54% of samples (41% of white wines and 60% of red wines) exceeded the legal max. of 0.30 ppm. Factors responsible for the relatively high pB concn. in wines are discussed, and it is recommended that the tolerance for Pb in wine should be increased. AJDW

## 9

**Pollution of vineyards by atmospheric lead.**
Favretto, L.; Pertoldi Marletta, G.; Favretto Gabrielli, L.
***Journal of the Science of Food and Agriculture*** **26** (7) 987-992 (1975) [15 ref. En] [Istituto di Merceologia, Univ. di Trieste, 34100 Trieste, Italy]

Pb accumulation in vineyards exposed to automobile exhaust gases was studied by means of 3 indicator materials (grapes, leaves and soil) samples at increasing distances from the source. The regression analysis of concn. data on the logarithm of the distance, based on an accepted model, shows that these 3 materials are suitable for detecting the extent of pollution. Far from the source, where the polluting effect is negligible, the mean typical levels of Pb in these materials are 0.43, 6.7 and 16.2 µg/g dry wt., respectively. The contribution of atmospheric Pb to the pollution of plant materials, at various distances from the source, is thus simply evaluated. The surface contamination of grapes and leaves is also discussed. AS

## 10

**Lead from motor-vehicle exhausts in sweet-corn plants and soils along a highway in Hawke's bay, New Zealand.**
Ward, N. I.; Reeves, R. D.; Brooks, R. R.
***New Zealand Journal of Science*** **18** (2) 261-267 (1975) [28 ref. En] [Dept. of Chem., Biochem. & Biphysics, Massey Univ., Palmerston North, New Zealand]

Studies on Pb concn. (determined by atomic absorption spectrophotometry) in and on the stalks, leaves, husks, cobs and kernels of sweet corn plants grown near the main Hastings-Napier highway, New Zealand, are described. Tables and graphs of results are given. Kernels from sweet corn plants grown 10 m from the road contained ≤10 ppm Pb (ash wt. basis); Pb concn. decreased with increasing distance from the road, reaching the background level (0.5 ppm) in plants grown 120 m from the road. It is concluded that Pb contamination of sweet corn grown near roads presents no significant health hazard. AJDW

## 11

**Renal response to lead.**
Grasso, P.
***Food and Cosmetics Toxicology*** **13** (4) 467-468 (1975) [11 ref. En] [British Ind. Biol. Res. Ass., Woodmansterne Road, Carshalton, Surrey, UK]

Consideration is given to renal changes associated with Pb intoxification. Aspects considered are: Pb penetration into the renal cells; functional state of the mitochondria; amino-aciduria development; and renal damage in various animal spp. VJG

### 12

**[Lead and cadmium migration from Porcelite table ware into a model liquid.]**
Zawadzka, F.; Brzozowska, B.
***Roczniki Panstwowego Zakladu Higieny*** 26 (4) 483-488 (1975) [8 ref. Pl, ru, en] [Panstwowy Zaklad Higieny, Warsaw, Poland]

Porcelite [? porcelain-glazed] green, yellow and brown cups, yellow and brown plates (dessert, dinner, soup), green sugar bowls, and brown teapots were examined. 5 pieces of each type of crockery were washed, dried, filled with 4% acetic acid solution, allowed to stand for 24 h at 20°C, and the contents were evaporated to dryness and analysed for Pb and Cd; the pieces were filled again with the acid solution and the procedure was repeated. Individual and mean values are tabulated for the 1st and 2nd migrations. Ranges of mean values were (mg/l.): Pb, 1st migration 0.0019 (yellow cup) - 0.0316 (green sugar bowl), 2nd migration 0 (yellow and brown cups) - 0.0022 (brown soup plate); Cd, 1st migration 0.00014 (yellow dinner plates with brown decoration) - 0.0009 (green sugar bowl), 2nd migration 0 (yellow dessert plates with brown decoration) - 0.0001 (green cup and green sugar bowl). The values found were below the official tolerance limits. SKK

### 13

**[Determination of some metals in drinking water by flameless atomic absorption spectrophotometry.]**
Ooghe, W.; Kastelijn, H.
***Annales des Falsifications et de l'Expertise Chimique*** 68 (728) 201-211 (1975) [14 ref. Fr] [Lab. de Bromatologie, Inst. de Pharmacie, 135 De Pintelaan, B-9000 Ghent, Belgium]

The metal contents of 15 commercially-bottled mineral waters and of 15 Belgian drinking waters were measured using 50 µl samples analysed in a Perkin-Elmer atomic absorption spectrophotometer equipped with an HGA-72 graphite oven and a deutrium background corrector. Optimal instrument conditions for determining Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Sn and Zn are described. The metal concn. (in µg/l.) in the mineral and drinking waters respectively were: Cd, <0.1-2.7 and <0.1-0.3; Co, <1 and <1; Cr, <1-2.5 and <1-2.0; Cu, <1-119 a <1-1235; Fe, <0.5-35 and <0.5-1260; Mn, <0.5-364 and 3-420; Ni, <2 and <2; Pb, <1-2.5 and <1-10.5; S <10 and <10; and Zn, 1.3-253 and 1.0-1900. Levels of Cd, and Pb were below the max. permitted levels in Belgium drinking waters (10 µg Cd/l. and 50 µg Pb/l., respectively). MEG

### 14

**Determination of lead in 'instant' coffee and tea powders by carbon filament atomic absorption spectrometry.**
Kapur, J. K.; West, T. S.
***Analytica Chimica Acta*** 73 (1) 180-184 (1974) [7 ref. En] [Chem. Dep., Imperial Coll., London SW7 2AY, UK]

The conventional dithizone or AAS methods for detn. of Pb in coffee or tea powders are not satisfactory at low levels of Pb; the permitted level for instant coffee or tea powders is ≤2 ppm Pb. An AAS method using carbon filament spectroscopy at 217 nm is described. The filament is 1 cm long × 3.2 mm diam., with a notch 2 mm long and 1 mm deep to contain a 5 µl drop of sample (whole apparatus described in detail). In initial experiments, excellent results were obtained with pure aqueous Pb solutions but recoveries from coffee solutions were inadequate. Attempts to improve solution of the coffee by acid or alkali treatments failed, but success was obtained by dissolving the powder in ammonium citrate solution at pH 8.7-9.3. Voltage sequence applied was: 10 s at 0.5 V (drying); interval 45 s; 10 s at 2.0 V (pyrolysis); 60 s interval; 8 V (atomization). The method had a relative SD of 6%, the lowest detection limit was 0.2 ppm Pb in powder, and the time required was 5 min. To improve the sensitivity of the direct analysis method, 5% coffee solutions were mixed with ammonium citrate and KI; the Pb-iodide complex was extracted into methyl isobutyl ketone, concentrated and analysed with voltage sequences of 0.5 V for 5 s, 3 V for 6 s and 8 V. This extended the time for analysis to 1.0-1.5 h, but determined Pb down to 0.02 ppm with no loss of precision (6%). ELC

### 15

**Heavy metals in cane sugar products. II.** [Lecture]
Clarke, M. A.; Morris, N. M.; Tripp, V. W.; Carpenter, F. G.
***Publications of Technical Papers and Proceedings of the Annual Meeting, Sugar Industry Technologists*** 33, 91-100 (1974) [15 ref. En] [S. Regional Res. Cent., USDA, New Orleans, Louisiana 70179, USA]

Using the same sugars and syrups as in previous work [see preceding abstr.], studies were made of Co, Ni, Cd and Zn contents, and revised results were obtained for Pb contents. A new AAS technique was developed for determining Pb and other metals of low volatility. Cd and Pb contents were well below any levels of concern to the industry or regulatory agencies. Results are presented in graphs and tables. Ranges of contents (ppm) in raw and refined sugar, respectively, were: Pb, 0.09-0.28, 0.006-0.03; Ni, 0.1-0.2, 0.05; Co, 0.02-0.06, <0.0008; Cd, <0.001-0.01, 0.0001-0.004; Zn, 0.005-0.9, <0.001-0.2. [See 8 3L217.] JA

### 16

**Aerobic digested municipal garbage as a feedstuff for cattle.**
Johnson, J. C., Jr.; Utley, P. R.; Jones, R. L.; McCormick, W. C.
***Journal of Animal Science*** 41 (5) 1487-1495 (1975) [16 ref. En] [Georgia Coastal Plain Exp. Sta., Tifton, Georgia 31794, USA]

Jersey bull calves, Charolais crossbred and Hereford steers and lactating Jersey cows were used in a series of feeding trials conducted to evaluate effects of diets containing (i) 17.5% digested municipal garbage or (ii) 17.5% cottonseed hulls (control diet) on the concn. of heavy metals, pesticide residues and polychlorinated biphenyls

(PCB) in milk, liver, fat, kidney and muscle tissue. Lactating cows received (i) or (ii) for ≤42 days; calves received (i) or (ii) for ≤91 days. Tables of results are given for Pb, Cd, Cu, Zn, Bi, Sb, Hg Se, As, DDT, DDE, TDE and PCB concn. in milk and the tissues studied. The results show that there may be problems with excessive Pb and PCB levels in cattle receiving (i). AJDW

## 17

**[Analysis of heavy metals in fruit juices.]** Beitrag zur Analytik des Schwermetallgehaltes von Fruchtsäften.
Bielig, H. J.; Dreyer, H.; Treptow, H.
***Flüssiges Obst*** **42** (9) 369-375 (1975) [10 ref. De, en, fr] [Inst. für Lebensmitteltech., Tech. Univ., Berlin (West)]

The following mean values (μg/kg) are tabulated for As, Pb and Cd contents, determined by AAS using Perkin-Elmer equipment (number of samples in parentheses, metals in order stated above): apple juice, clear (16) 25.0, 40 and 7.7; apple juice, cloudy (10) 22.3, 38 and 8.2; apricot juice (1) 26, 36 and 10; pear juice (1) 32, 11 and 8; grapefruit juice (7) 24.3, 86 and 8.2; redcurrant juice (1) 20, 30 and 5; blackcurrant juice (21) 24.0, 46 and 8.1; cherry juice (20) 26.3, 36 and 8.1; orange juice (14) 30.6, 31 and 8.9; grape juice, red (18) 43.8, 101 and 9.2; grape juice, white (16) 41.4, 96 and 9.2; plum juice (1) 30, 15 and 9; blackcurrant mother-juice (1) 21, 28 and 9; cherry mother-juice (2) 30, 33 and 8; blackcurrant juice, 6-fold concentrate (1) 116, 220 and 80; and cherry juice, 6-fold concentrate (1) 146, 190 and 9.2. Hg contents of all unconcentrated juices tested above were <5 μg/kg; and for the 2 concentrates, they were 10 and 8, respectively. SKK

## 18

**[Lead, an ubiquitous toxic agent.]** Blei, ubiquitärer Schadstoff. [Review]
Buntenkötter, S.
***Deutsche Tierärztliche Wochenschrift*** **81** (14) 340-344; (15) 365-367 (1974) [74 ref. De] [Tierärztliche Hochschule, Hanover, Federal Republic of Germany]

This comprehensive review includes tabulated comparative data on the occurrence of Pb in milk, dried milks, meats, fish and eggs. EJM

## 19

**Metabolism and toxicity of cadmium, mercury and lead in animals; a review.** [Review]
Neathery, M. W.; Miller, W. J.
***Journal of Dairy Science*** **58** (12) 1767-1781 (1975) [112 ref. En] [Dep. of Anim. & Dairy Sci., Univ. of Gerogia, Athens, Georgia 30602, USA]

Toxicity, absorption, blood transport, tissue distribution and metabolism of Cd, Hg and Pb in animals are reviewed in detail. Cd and Hg tend to accumulate in the kidneys and liver, while most Pb is retained in the skeleton. Relatively little of absorbed Cd and inorganic Hg in animals is secreted into milk or deposited in muscle. However, methyl mercury tends to be deposited in muscle and absorbed Pb is secreted into milk under certain conditions. MC

## 20

**[Lead and cadmium contents of wines, musts and grapes in the vicinity of a source of contamination.]** Blei- und Cadmiumgehalte von Wein, Weinmost und Weintrauben aus der Umgebung einer Immissionsquelle.
Mack, D.
***Deutsche Lebensmittel-Rundschau*** **71** (12) 431-432 (1975) [9 ref. De, en, fr] [Chem. Landesuntersuchungsanstalt, Stuttgart, Federal Republic of Germany]

The author's rapid flameless AAS method [see FSTA (1975) **7** 8H1169] was used in studies on the Pb and Cd contents of grapes and wines from the vicinity of a factory producing Pb- and Cd-containing pigments. Wine samples produced in 1969-1974 were studied; a table of results is given. Pb concn. ≤0.64 ppm and Cd concn. ≤0.041 ppm (both values considerably above normal levels) were recorded. Grapes were collected in 1973 and 1974 at various distances (200 m-15 km) from the factory; Pb and Cd concn. were determined in the resulting mashes. A table of results is given. Pb and Cd concn. decreased with increasing distance from the factory. Cd concn. in mashes made from grapes grown near the factory had very high Cd concn. (≤0.36 ppm); Pb concn. were generally within normal limits. Washing the grapes with HCl markedly reduced the Pb concn., but had little effect on the Cd concn. It is concluded that the Pb contamination is mainly on the surface of the grapes, but that Cd contamination is within the grape tissues. AJDW

## 21

**[Determination of lead in wine by flameless atomic absorption spectrometry.]** Zur Bestimmung von Blei in Wein mit flammenloser Atomabsorptionsspektrometrie.
Haller, H. E.
***Deutsche Lebensmittel-Rundschau*** **71** (12) 430 (1975) [3 ref. De] [Max. von Pettenkofer-Inst. des Bundesgesundheitsamtes, 1 Berlin (West) 33]

Mack's rapid method [see FSTA (1975) **7** 8H1169] for detn. of Pb in wines and fruit juices by flameless AAS is critically discussed, with special reference to possible inaccuracies resulting from the different rates of ashing and vaporization of the Pb in the wine and Pb in standards in the graphite crucible. AJDW

## 22

**[Reply to the paper by H. E. Haller.]**
Stellungnahme zu dem Beitrag von H. E. Haller.
Mack, D.
***Deutsche Lebensmittel-Rundschau*** **71** (12) 430-431 (1975) [1 ref. De] [Chem. Landesuntersuchungsanstalt, Stuttgart, Federal Republic of Germany]

Haller's comments [see preceding abstr.] on the author's rapid flameless AAS method for detn. of Pb in wines and juices are discussed. Comparative data for Pb concn. (determined by the author's method and by a flame-AAS method) in 3 wines are given, showing close agreement between the 2 methods. AJDW

## 23

**[Studies of black tea. I. Contents of mercury, lead and cadmium in tea leaves and tea infusions.]**
Untersuchungen über schwarzen Tee. I. Gehalt an Quecksilber, Blei und Cadmium in Teeblättern und Teeaufgüssen.
Feldheim, W.; Stelte, W.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **159** (5) 293-296 (1975) [5 ref. De, en] [Inst. für Ernährungswissenschaft I, Justus Liegib-Univ., Giessen, Federal Republic of Germany]

In a survey of the content of toxic trace elements in 25 teas from different countries, Pb concn. was found to range up to 3.08 ppm, Cd up to 0.012 ppm, and Hg up to 3.0 ppm in air-dried tea leaves. The concn. in tea infusions was much lower: Pb up to 0.007 ppm and Cd below the level of detection [Hg content not determined]. AS

## 24

**An appraisal of toxic metal residue in the soils of a disused sewage farm. II. Lead, cadmium and arsenic, with notes on chromium.**
Pike, E. R.; Graham, L. C.; Fogden, M. W.
***Journal of the Association of Public Analysts*** **13** (2) 48-63 (1975) [22 ref. En] [County Analyst's Dep., Fillingate, Wanlip, Leicester, UK]

Figures are given for the uptake by lettuce, radish, cabbage, cauliflower, carrot, tomato, beans, sprouts, potatoes and savoys o Pb, As, Cd and Cr derived from soils of a disused sewage farm. No definite evidence was found to show that abnormal amounts of these toxic metals were taken up by vegetables grown on such soils (concn. in soil (ppm) Pb 127-982, Cr 80-1160, Cd 2.8-18.0, As 8-36). Metal concn. in vegetables were normal, and in no instance was a statutory or recommended limit exceeded. [See FSTA (1975) 7 8J1217 for part I.] JRR

## 25

**[Toxic heavy metals in cereals.]** Toxische Schwermetalle in Getreide.
Ocker, H. D.; Hack, A. G.
***Getreide, Mehl und Brot*** **29** (12) 305-308 (1975) [5 ref.-De] [Bundesforschungsanstalt für Getreideverarbeitung, Detmold, Federal Republic of Germany]

Upper limits for the content of toxic metals in cereals and cereal products in the Federal Republic of Germany have been set for the present at (mg/kg): Hg 0.03, Pb 0.5, Cd 0.1, As 1.0. A survey was made of the Hg, Pb and Cd contents of wheat grown in the Federal Republic of Germany and Argentina, of maize grown in the Federal Republic, and of rice grown in many countries. Results are tabulated. In most cases the contents of the 3 metals were below the recommended upper limits. JVR

## 26

**A preliminary study on the effect of time on apparent lead content of evaporated milk as determined by non-flame atomic absorption spectrometry.**
Huffman, H. L. Jr.; Caruso, J. A.
***Talanta*** **22** (10/11) 871-875 (1975) [28 ref. En] [Dep. of Chem., Univ., Cincinnati, Ohio 45221, USA]

Analysis of several brands of canned evaporated milk at various times after opening showed increases in the Pb content upon standing. Initially all samples had a Pb content within the range 0.1-0.2 ppm. Upon standing, however, the Pb concn. of a number of samples doubled or tripled. Control samples obtained by pouring approx. half of the milk from a can into a polyethylene bottle immediately after opening showed no such increase. When atmospheric $O_2$ was excluded by bubbling $N_2$ through a sample there was likewise no increase in Pb for the sample. Bubbling $O_2$ through the samples produced an increase in the Pb content of the milk left in the can but did no affect that of the milk in the polyethylene bottle. AS

## 27

**[Milk and milk products. Determination of lead content.]**
**Bulgaria**, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
***Bulgarian Standard*** **BDS 10691-73**, 7pp. (1973) [Bg]

This standard, which partially supersedes **BDS 1554-53**, is based on photometric detn. of the colour intensity of the compound formed by the Pb ion with diphenylthiocarbazone (dithizone). It applies to whole milk, skim-milk, cultured milk, cultured milk products, buttermilk, whey, cheese, curd, cheese products, butter, casein, caseinates, dried milk products, and ice cream. Aspects covered are sampling, test apparatus, carrying out of the test, and use of a standard curve. HBr

## 28

**Determination of small amounts of lead in organic matter by atomic-absorption spectrometry.**
**United Kingdom**, Chemical Society, Analytical Methods Committee
***Analyst* 100** (1197) 899-902 (1975) [6 ref. En] [Burlington House, London WIV OBN, UK]

The method presented in this report prepared by the Metallic Impurities in Organic Matter Sub-Committee involves digestion with $H_2O_2$ + $H_2SO_4$, complexing the Pb with ammonium pyrrolidine dithiocarbamate, extracting the complex into 4-methylpentan-2-one, and aspirating this solution into the burner of an atomic-absorption spectrometer. Results of detn. of Pb in lime juice, tomato soup and a baby food consisting of a strained cheese savoury, are given for samples with or without added Pb (0.5-2.0 ppm). AL

## 29

**[Lead in foods of animal origin consumed in Italy.]**

Cantoni, C.; Renon, P.; Cattaneo, P.
***Industrie Alimentari* 14** (12) 63-68 (1975) [17 ref. It, en] [Istituto di Ispezione degli Alimenti di Origine Animale, Univ. degli Studi di Milano, Milan, Italy]

Pb was determined in 20 samples each of various foods (milk, pork, pigs' liver, pigs' brains, beef, bovine liver, bovine kidneys, bovine spleen, bovine brain, dogfish, fresh tuna, canned tuna, clams (Venus gallinae) and ragout) in Italy; a table of mean values with ranges is given. Pb concn. in the foods studied ranged from 0.065 mg/kg (milk, pork) to 1.296 mg/kg (bovine kidneys). Ragout, clams and bovine spleen also had high Pb concn. (>1.0 mg/kg). Literature data for Pb concn. in foods in Italy and other countries are also given. AJDW

## 30

**[Determination of lead, cadmium, copper and zinc in plant and animal material by atomic absorption spectrometry (flame and graphite-tube procedures) by the Schöniger method.]** Bestimmung von Blei, Cadmium, Kupfer und Zink in pflanzlichem und tierischem Material mit Hilfe der Atomabsorption in der Flamme und im Graphitrohr durch Aufschluss des Materials nach dem Schöniger-Verfahren. [Lecture]
Vondenhoff, T.
***Mitteilungsblatt der GDCh-Fachgruppe Lebensmittelchemie und Gerichtliche Chemie* 29** (12) 341-345 (1975) [7 ref. De] [Lehrstuhl für Lebensmittelwissenschaft, Univ., Bonn, Federal Republic of Germany]

Detailed instructions (sample preparation, ashing, AAS conditions) are given for detn. of Cu and Zn by flame AAS, and for detn. of Pb and Cd by AAS using a graphite tube cuvette. At high concn., Cd may alternatively be determined by flame AAS; this technique is, however, unsuitable for Pb. Reference curves for Cd and Pb are non-linear; methods for overcoming this problem are briefly described. [See FSTA (1976) **8** 6A294.] AJDW

## 31

**[Residues of heavy metals in foods of animal origin. II. Lead in fresh and canned meat and fish products.]**
Maggi, E.; Bracchi, P. G.; Madarena, G.
***Atti della Societa Italiana delle Scienze Veterinarie* 28**, 664-668 (1974) [13 ref. It, fr, en] [Istituto di Ispezione degli Alimenti di Origine Animale, Parma, Italy]

Pb was determined by polarography in a total of 176 samples of fresh, frozen or canned meat and meat products and 105 samples of fresh, frozen or canned fish and fish products. Tables of results are given. Meat and meat products contained ≤5.70 mg Pb/kg (mean value 0.48 mg/kg); fish and fish products contained ≤6.25 mg/kg (mean value 0.59 mg/kg). Overall, fresh and frozen products contained ≤1.05 mg Pb/kg, products in cans contained ≤6.25 mg/kg, and heat-treated products in containers other than cans contained ≤0.75 mg/kg. AJDW

## 32

**[Lead content of Hungarian wines.]**
Mattyasovszky, P.; Nagy, L.
***Borgazdasag* 23** (3) 110-112 (1975) [7 ref. Hu] [Orsz. Borminosito Intezet, Budapest, Hungary]

50 ml samples of wine from 14 different regions were processed with a mixture of $HNO_3$ and $H_2O_2$ and the extracts subsequently analysed by AAS, using a Pye-Unicam SP-1900 spectrometer. Results are tabulated. Mean Pb contents (mg/l.) varied from 0.18 (balaton region) to 0.42 Tokaj region. The overall mean was 0.24. IF

## 33

**Accumulation of toxic heavy metals by plants in Missouri's lead belt.** In "Trace element metabolism in animals - 2". [See FSTA (1976) **8** 2A299.] [Lecture]
Hemphill, D. D.
pp. 458-460 (1974) [En] [Environmental Trace Substances Cent., Univ. of Missouri, Columbia, Missouri, USA]

This paper includes data for Pb and Cd concn. in samples of lettuces, radishes and green beans grown in: (i) N. Missouri, in an area with no lead mining or smelting, and little industrial activity; (ii) the 'old lead belt' in which lead mining and smelting have been conducted for many years; and (iii) in the 'new lead belt', where lead mining and smelting has started fairly recently. Mean values (with ranges in parentheses) for Pb concn. were (for lettuces, radishes and green beans respectively, μg/g dry wt.): (i) 20.6 (6.9-33.9); 7.7 (range not given), and ≤5 (range not given); (ii) 83.8 (10.3-742.0) 33.4

(5.0-518), and 5.4 (5.0-10.1); and (iii) 114 (range not given), 22.3 (range not given) and 8.8 (range not given). Cd concn. in the vegetables were generally ≤2 μg/g dry wt.; however, in a small town with a smelter operating since the 1890's, Cd concn. were (mean values with ranges in parentheses, μg/g dry wt.): lettuce 13.02 (3.3-34.5); radish 4.72 (1.18-13.7); and green beans 2.36 (0.5-8.5). AJDW

## 34

**Heavy metal contamination of vegetables and soil in domestic gardens around a smelting complex.**
Beavington, F.
***Environmental Pollution*** **9** (3) 211-217 (1975) [9 ref. En] [Univ. of Wollongong, NSW, Australia]

Leaf vegetables and soil from gardens in a zone of 0.5 km radius around the Cu smelter in Wollongong, Australia were analysed by AAS for levels of Cu, Zn, Pb, Cd, Ni and Fe. Vegetables samples were lettuce, cabbage, garlic leaf, mint and chillies. Results are tabulated. Lettuce samples contained the highest levels with 23.0 ppm Pb and 4.5 ppm Cd compared with 10.3 ppm Pb and 1.16 ppm Cd for other leaf vegetables. Correlation coeff. between levels of metals in the vegetables are also tabulated. Highly significant correlations were found between distance from the chimney and levels of easily extractable metals in the soil. CRI

## 35

**Determination of lead and cadmium in milk with modern analytical methods.**
Jonsson, H.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **160** (1) 1-10 (1976) [26 ref. En, de] [Swedish Dairies' Ass., Cent. Lab., Malmö, Sweden]

Methods tested were differential-pulse anodic-stripping voltammetry (DPASV) and flameless atomic-absorption spectrophotometry (FAAS). Under the circumstances in which these methods were used, the analytical procedure based on DPASV was the most sensitive, with an estimated detection limit of about 0.2 μg/l. for Pb and Cd in liquid milk. The pretreatment of the milk samples before the DPASV-analysis included: freeze-drying, ashing in a muffle furnace at 550°C and finally dissolution of the ash in 0.1M HCl. Recoveries of known amounts of Pb and Cd added to milk were 95 and 59%, respectively. In 98 samples of Swedish market milk the mean (±SD) Pb content was 2.0 ± 0.5 μg/l.; Cd was <0.2 μg/l. in all the samples. AS

## 36

**Lead and mercury residues in kidney and liver of Canadian slaughter animals.**
Prior, M. G.
***Canadian Journal of Comparative Medicine*** **40** (1) 9-11 (1976) [7 ref. En, fr] [Anim. Path. Div., Agric. Canada, J. S. Fulton Building, 40 Campus Drive, Saskatoon, Saskatchewan S7N OX1, Canada]

Liver and kidney samples were collected from Canadian slaughter animals during the winter of 1973-1974. A total of 256 samples were analysed for Pb. Mean Pb levels of 1.02 ppm in poultry liver, 1.04 ppm in bovine liver, 1.02 ppm in bovine kidney, 0.73 ppm in pork liver and 0.85 ppm in pork kidney were found. A total of 265 samples were analysed for Hg. Mean Hg levels of 0.003 ppm in poultry liver, 0.007 ppm in bovine liver, 0.008 ppm in bovine kidney, 0.001 ppm in pork liver and 0.013 ppm in pork kidney were found. All levels detected were below the Canadian official tolerance of 2 ppm for Pb and administrative tolerance of 0.5 ppm for Hg. AS

## 37

**Lead contamination of vegetation grown close to roads.**
Havre, G. N.; Underdal, B.
***Acta Agriculturae Scandinavica*** **26** (1) 18-24 (1976) [14 ref. En] [Dep. of Biochem., Vet. Coll. of Norway, Oslo, Norway]

A study was made in 1972 and 1973 of the concn. of Pb in grass, cereals, fruit and vegetables grown at distances of 0-250 m from roads of low to high traffic density in Norway. Pb was determined by AAS and results are tabulated. Both washed and unwashed and, where appropriate, peel and flesh samples were analysed. Pb concn. in leafy vegetables (e.g. lettuce) was relatively high in some areas and it is recommended that they should not be grown near roads, although some Pb was removed by washing. In root vegetables and fruit, most Pb occurred in the peel. A correlation was found between the density of motor traffic and pB concn. in above-ground vegetation. JA

## 38

**[Lead content of some canned foods.]**
Parada A., E.; Velasco G., O.; Avila U., M.
***Tecnologia de Alimentos*** **10** (4) 170-173 (1975) [15 ref. Es, en] [Escuela Nacional de Ciencias Biol., IPN, Apartado Postal 42-186, Mexico]

97 samples of canned fruit juice and 76 of chillies in vinegar were analysed. pH ranges in the 2 products, respectively, were 3.15-4.45 and 3.52-4.51, Pb contents 0.06-2.84 and 0.70-5.86 ppm. 70 samples of fruit juice contained <0.3 ppm Pb (mean 0.18), 27 samples of fruit juice and all chillies contained >0.3 ppm Pb (means 0.65 and 1.74). Examination of the cans showed that only 4 and 2% respectively were lacquered all over and in good condition. It is concluded that canning methods and quality control in Mexico need improving. RM

## 39

**[Lead content in foods of animal origin from a polluted region.]**
Nagy, S.; Tartia, G.; Muresan, C.; Iancut, A.
***Igiena*** **24** (1) 25-29 (1975) [11 ref. Ro, en, ru] [Inst. de Sanatate Publica si Cercetari Med., Cluj-Napoca, Romania]

Samples taken from an industrially-polluted area were compared with those from normal, cleaner areas. Pork from the 2 areas contained means of 4.08 and 0.88 mg Pb/kg, respectively. For eggs, values were 3.96 vs. 1.36 mg Pb/kg, with the most Pb in the egg yolk. Brinza cheese contained an average of 3.37 mg Pb/kg in the polluted area, 1.24 mg at 10 km from the polluted area, and 0.38 mg from an unpolluted area. JMD

## 40

**Collaborative study of effect of light on cadmium and lead leaching from ceramic glazes.**
Krinitz, B.; Holak, W.
***Journal of the Association of Official Analytical Chemists*** **59** (1) 158-161 (1976) [6 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

A limited interlaboratory study was carried out to determine the effect of lighting conditions on the release of Cd from ceramic glazes by 4% acetic acid. Cd release increased with increased exposure to light. Further interlaboratory study on plates manufactured under controlled conditions showed that if temp., intensity of illumination, and time of exposure are specified, reproducible results for leaching of both Pb and Cd can be obtained. A modification of the official AOAC method 25.031-25.034, to increase sensitivity was collaboratively studied by 8 laboratories. Each received 6 solutions of Pb in 4% acetic acid (3 sets of blind duplicates at the 0.1, 0.5, and 0.8 μg/ml levels) plus a reagent blank. Average recoveries were 0.1006, 0.5056, and 0.8194 μg/ml, respectively, with coeff. of variation of 11.4, 3.3, and 2.8%, respectively. The proposed modification is simple, rapid, and accurate. The modification has been adopted as official first action, and a parameter for exposure to light during extraction has been included in the method. AS

## 41

**Lead in water and mental retardation.** [Letter]
Elwood, P. C.; Morton, M.; Leger, A. S. St.
***Lancet*** **1** (7959) 590-591 (1976) [3 ref. En] [MRC Epidemiology Unit (S. Wales), 4 Richmond Road, Cardiff CF2 3AS, UK]

A brief account is given of a study on the relationship between the pB concn. of drinking water and the incidence of mental retardation in Gwynedd, North Wales. Water samples from the homes of 41 educationally-subnormal children born in 1967 and from the homes of control normal children were analysed for Pb. Pb levels in drinking water ranged from 0.001 to 0.3 ppm; no significant difference between Pb concn. in drinking water from the homes of educationally-subnormal and normal children was observed. AJDW

## 42

**[The determination of trace amounts of lead in sorbitol and other saccharides by stripping voltammetry.]**
Sourek, R.; Flanderkova, B.; Stulik, K.
***Chemicke Listy*** **69** (11) 1207-1210 (1975) [12 ref. Cs, ru, en, de] [Chemopetrol MCHZ NP, Ostrava, Czechoslovakia]

Pb in trace amounts (<0.1 ppm) in sorbitol is best determined by means of stripping voltammetry. A recording is made by LP-7 polarograph; a detailed description is given of the detn. procedure. SD is ±8.8%. The method can be applied to other water-soluble saccharides. The water-insoluble saccharides must be decomposed first by pyrolysis. With reducing saccharides the electrode surface is quickly blocked, so that modification is necessary after every measurement. The procedure can also be used to determine other metals, particularly Cu. STI

## 43

**[Effect of oral administration of Pb to cows on the Pb content of blood, milk and urine and on the blood ALA-dehydrogenase activity.]**
Setti, F.; Lanfranco, M.; Durio, P.; Gilli, G.
***Atti della Societa Italiana delle Scienze Veterinarie*** **28**, 695-698 (1974) [19 ref. It, fr, en] [Istituto di Zootecnica Generale, Fac. di Med. Vet., Univ. di Torino, Turin, Italy]

4 Friesian cows in the 1st or 4th month of lactation and yielding 12 l. milk/day, were each fed each day for 25 days 1 capsule containing 1 g Pb as mixed chloride and oxide. Initial values for Pb contents were 0.035 ppm in blood and 0.17 ppm in milk, rising to a max. of 0.12 ppm in blood and 0.24 ppm in milk. JMD

## 44

**Human milk as a dietary source of cadmium and lead.** (In "Trace substances in environmental health - VI" [see FSTA (1976) 8 7A337].) [Lecture]
Pinkerton, C.; Hammer, D. I.; Bridbord, K.; Creason, J. P.; Kent, J. L.; Murthy, G. K.
pp. 39-43 (1973) [15 ref. En] [Nat. Environmental Res. Cent., Environmental Protection Agency, Res. Triangle Park, North Carolina 27711, USA]

Cd and Pb levels in (i) 14 human and (ii) 33 cows' milk samples obtained from the same geographic area (Cincinnati, Ohio, USA), were determined by AAS. Average Cd and Pb concn. were respectively 0.011 and 0.0109 ppm in (i) and 0.027 and 0.42 ppm in (ii). It was calculated that under conditions of a cows' milk + high solids diet, a bottle-fed infant could take in approx. 30 × the level of Pb and 15 × the level of Cd taken in by an exclusively breast-fed infant. Other data show

estimated Cd intake at various stages of adolescence, from cows' milk and from solid food estimated to contain 0.066 ppm Cd [see G. K. Murthy et al., Environmental Science and Technology (1971) No. 5, 434]. MC

## 45

**Effect of dietary lead on performance, tissue mineral composition and lead absorption in sheep.**
Fick, K. R.; Ammerman, C. B.; Miller, S. M.; Simpson, C. F.; Loggins, P. E.
***Journal of Animal Science*** **42** (2) 515-523 (1976) [26 ref. En] [Dep. of Anim. Sci., Univ. of Florida, Gainesville, Florida 32611, USA]

20 wether lambs (average initial live wt. 36 kg) were used in an 84-day feeding trial conducted to evaluate effects of supplementation of the diet with Pb (10, 100, 500 or 1000 ppm, as lead acetate) on performance and on mineral concn. in various tissues. Control animals received a diet without Pb supplementation. A table of values is given for Pb, Mn, Cu, Fe, Zn, Mg, Ca and P concn. in liver, kidney, heart, spleen, bone, brain and muscle of lambs receiving the various levels of dietary Pb. Pb concn. increased with increasing dietary Pb level in all tissues except muscle. Tissue concn. of the other elements studied were not significantly influenced by the Pb concn. in the diet. AJDW

## 46

**On the interaction of melanoidin with metallic ions.**
Gomyo, T.; Horikoshi, M.
***Agricultural and Biological Chemistry*** **40** (1) 33-40 (1976) [7 ref. En] [Lab. of Nutr. Sci. of Food, Kagawa Nutr. Coll., Toshima-ku, Tokyo, Japan]

Melanoidin, obtained from a browning solution prepared from a glycine/D-glucose system by acid precipitation, displays a noticeable character attributable to an amphoteric polyvalent electrolyte with the isoelectric point at pH 2.5. The number of protons released during titration from the isoelectric point to pH 11.0 is approx. 500/molecule of melanoidin. Thus, melanoidin shows a remarkable coagulation in the presence of various metallic ions though affected by metal concn., pH and the presence of other chelating agents such as EDTA. The behaviour of melanoidin towards metallic ions is in common with anionic hydrophilic colloids. The metal binding ability of melanoidin was confirmed on the basis of difference spectra, titration curves and dialysis equilibria. The stability constants and the number of binding sites were approx. calculated from the results of dialysis equilibria in respect to $Fe^{3+}$ and $Cu^{2+}$. Melanoidin was evaluated as a powerful metal scavenger in an attempt to elucidate its antioxidative effect. AS

## 47

**[Metal poisoning by items of utility.]** [Lecture]
Nuijt, M. F.
***Voeding*** **37** (3) 110-116 (1976) [4 ref. Nl, en] [Keuringsdienst van Waren, Haarlem, Netherlands]

Release of Pb and Cd from glazed ceramics and enamelled utensils is discussed, with reference to Dutch and foreign test methods and tolerances. The effect of light on Cd release is briefly considered. A brief account is given of studies on uptake of Pb from a fondue dish by 3% acetic acid model solution and various liquid and solid foods; liquids were tested with 3 successive contact periods of 2 h (using a fresh food sample each time); solid foods were tested with 2 successive 2 h periods. Histograms of results are given. Solids took up less Pb than liquids; Pb uptake increased with decreasing food pH. Coca-cola and other soft drinks had higher Pb uptakes than the 3% acetic acid solution. Effects of contact time on Pb uptake are discussed. AJDW

## 48

**[Factors influencing the toxicity of heavy metals in food.]** [Lecture]
Huisingh, D.; Huisingh, J.
***Tecnologia de Alimentos*** **10** (4) 145-151, 153-156, 158, 188 (1975) [59 ref. Es, en] [N. Carolina State Univ., Raleigh, N. Carolina 27607, USA]

See FSTA (1975) **7** 3C78.

## 49

**The influence of milk and related dietary constituents on lead metabolism.** [Review]
Stephens, R.; Waldron, H. A.
***Food and Cosmetics Toxicology*** **13** (5) 555-563 (1975) [122 ref. En] [Dep. of Chem., Univ. of Birmingham, PO Box 363, Birmingham B15 2TT, UK]

Studies using whole milk or milk products to counteract Pb poisoning are discussed. Consideration is then given to the influence of separate constituents of milk (Ca, P, vitamin D, fat, protein, vitamin C, citric acid and lactose) on ingested Pb. It was concluded that although milk contains components that hinder Pb absorption, its overall effect is to promote the absorption of Pb from the intestinal tract. VJG

## 50

**[A source of lead contamination of wines.]**
Hamelle, G.
***Annales des Falsifications et de l'Expertise Chimique*** **69** (737) 101-105 (1976) [Fr, en] [Lab. de Chimie Analytique et Toxicologie, Fac. de Pharmacie, Montpellier, France]

The author describes a recent case of lead poisoning in a wine cellarman. The wine from several of the wooden casks in the cellar contained 800-900 µg Pb/l. These casks had been repaired

with thin strips of Pb fixed internally between the staves with Cu nails. In a 500 ml sample of wine left in contact with a thin strip of Pb (1.5 × 25 × 25 mm) for 7 days, the Pb content increased from 0.30 to 20 mg/l. A similar strip coated with glycerophthalic paint gave a Pb content of 0.60 mg/l. The importance of preventing contact of wine with Pb surfaces is emphasized. MEG

## 51

**[Application of physico-chemical methods for the determination of lead in wine.]**
Petrino, P.; Cas, M.; Estienne, J.
***Annales des Falsifications et de l'Expertise Chimique*** **69** (737) 87-99 (1976) [15 ref. Fr]
[Inst. Univ. de Tech., Marseille, France]

During investigations into lead poisoning occurring on board ships in which wine was stored in small vats, different physico-chemical methods for measuring Pb in wine were compared. Direct measurement by AAS using an internal standard could detect >0.3 mg Pb/l. The sensitivity was improved (to 0.02-1.0 ppm) by chelating the Pb with ammonium pyrrolidine dithiocarbamate and extracting the complex with methyl isobutyl ketone before AAS measurement. Examination of the wine in the vats showed that the Pb contamination originated from the bronze taps (containing 3-5% Pb). The reservoir of wine (60 ml) in contact with the taps for 22 days acquired a Pb content of 22-65 ppm, and in one instance, wine in contact with a new bronze tap for 22 days accumulated 460 ppm. The use of higher quality bronze with a lower (0.37-0.50%) Pb content is suggested, and as a further precaution the inside of the taps should be coated with enamel. MEG

## 52

**Lead in water and mortality.** [Letter]
Elwood, P. C.; St. Leger, A. S.; Moore, F.; Morton, M.
***Lancet*** **1** (7962) 748 (1976) [4 ref. En] [MRC, Epidemiology Unit (S. Wales), 4 Richmond Road, Cardiff CF2 3AS, UK]

Data are given for Pb concn. in drinking water samples from the homes of numerous persons dying of malignant neoplasms, ischaemic heart disease, other circulatory disorders or respiratory disease in N.W. Wales during the period 1969-1973. The results fail to show any significant relation of the Pb content of drinking water to any of the diseases studied. AJDW

## 53

**[Lead content of Hungarian wines.]** Über den Bleigehalt in den ungarischen Weinen.
Nagy, L.; Posta, J.; Papp, L.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **160** (2) 141-142 (1976) [De, en]
[Inst. für Gerichtliche Med., Univ., Debrecen, Hungary]

A study was made by AAS of the Pb content of 560 Hungarian wines produced between 1969 and 1973. Samples were prepared by wet digestion with $HNO_3$-$H_2O_2$. In 94.12% of the investigated wines <0.4 ppm Pb was found. 2.67% of wines contained 0.4-0.6 ppm Pb. In 18 samples (3.21%) >0.6 ppm Pb was found. AS

## 54

**Determination of lead, cadmium, and zinc in sugar.**
Morris, N. M.; Clarke, M. A.; Tripp, V. W.; Carpenter, F. G.
***Journal of Agricultural and Food Chemistry*** **24** (1) 45-47 (1976) [10 ref. En] [S. Regional Res. Cent., USDA, New Orleans, Louisiana 70179, USA]

A new technique for eliminating matrix interference in the detn. of Pb, Cd and Zn in sugars by flameless atomic absorption is described. Yeast fermentation converts the sucrose to ethanol and $CO_2$, both of which are easily volatilized. Reproducible results for these elements are obtained with this technique. Relative SD for Pb and Cd was <10%, and for Zn <17%. Using this yeast fermentation technique, it was found that all 3 elements were present in raw and refined sugars at levels well below limits recommended by regulatory agencies. AS

## 55

**[Toxic heavy metals - analysis and importance for the starch industry.]** Toxische Schwermetalle - Analytik und Bedeutung für die Stärkeindustrie. [Lecture]
Ocker, H. D.
***Stärke*** **27** (10) 338-343 (1975) [6 ref. De, en, fr]
[Bundesforschungsanstalt für Getreideverarbeitung, D-4930 Detmold, 1, Am Schützenberg 12, Federal Republic of Germany]

Present Federal German legislation on max. permissible levels of toxic heavy metals in foods is discussed. The following tolerances are proposed for cereals and ceral products (mg/kg): Hg 0.03, Pb 0.5, Cd 0.1, As 1.0. Methods of analysis are discussed with reference to problems of interfering substances ('matrix effect'). A survey of contamination of grain in the Federal Republic, on the basis of published data, showed that domestic bread wheat contained <0.01 ppm Hg, 0.05-0.45 ppm Pb and generally about 0.05 ppm Cd (no figure given for As). A few samples of imported rice contained >20 parts/billion (ppb) Hg. Imported maize for starch production contained 0.0012-0.0024 ppm Hg, 0.002-0.008 ppm Cd and 0.02-0.25 ppm Pb; corresponding levels in domestic maize were, respectively (mean values in ppb for 7 var.): 1.8-6.2, 7-41 and 39-42. Most heavy metal contamination is removed during processing of cereals, e.g. dry dehulling. RM

## 56

**National Marine Fisheries Service preliminary survey of selected seafoods for mercury, lead, cadmium, chromium, and arsenic content.**
Zook, E. G.; Powell, J. J.; Hackley, B. M.; Emerson, J. A.; Brooker, J. R.; Knobl, G. M., Jr.
***Journal of Agricultural and Food Chemistry* 24 (1)** 47-53 (1976) [14 ref. En] [Southeast Util. Res. Cent., Nat. Marine Fisheries Service, Nat. Oceanic & Atmospheric Administration, US Dep. of Commerce, College Park, Maryland 20740, USA]

A preliminary screening study was conducted on Hg, Pb, Cd, Cr and As contents of 34 commonly consumed seafoods. 334 samples were analysed and, in general, 10 samples/species were obtained from a location. >96% of the samples fell below the FDA guideline of 0.5 ppm for Hg, with a mean level of 0.13 ppm. Mean Pb values among species tended to be rather uniform and only a few species averaged >0.6 ppm. No species mean exceeded 1 ppm. Cd content of most seafoods averaged <0.2 ppm. Cr was present at <0.4 ppm in all species. Arsenic levels showed the widest variation and were higher for some species than the other elements tested. Some possible relationships between elements within each species were encountered, but the data were too limited to draw firm conclusions. AS

## 57

**Content of copper, zinc, lead, cadmium and mercury in muscle, liver and kidney of Finnish cattle.**
Stabel-Taucher, R.; Nurmi, E.; Karppanen, E.
***Journal of the Scientific Agricultural Society of Finland*** 47 (6) 469-479 (1975) [24 ref. En, fi] [State Vet. Med. Inst., Helsinki, Finland]

Cu, Zn, Pb, Cd and Hg were determined by AAS in samples of muscle, liver and kidney tissue from a total of 120 cattle from 6 regions of Finland. Imported liver samples (10 from Australia, 10 from Poland and 15 from Ireland) were also studied. Tables of results are given. Mean values and ranges for Finnish samples (for muscle, liver and kidney respectively) were (mg/kg wet wt.): Cu 0.88 and 0.35-1.98, 59.7 and 3.5-199.0, and 4.11 and 2.2-6.0; Zn 50.4 and 14.7-95.3, 38.9 and 14.5-80.0, and 18.1 and 12.5-27.0; Pb 0.10 and 0.032-0.50, 0.27 and 0.06-0.75, and 0.28 and 0.05-0.85; Cd 0.02 and 0.001-0.95, 0.14 and 0.018-0.54, and 1.02 and 0.05-3.98; and Hg not detectable 0.03, not detectable 0.05, and not determined. Finnish liver samples had higher Cu concn. than the imported samples; concn. of Zn, Pb, Cd and Hg in Finnish and imported samples were similar. Correlations between Zn, Pb and Cd concn. in muscle, liver and kidney tissue from Finnish cattle are also given. AJDW

## 58

**[The effect of heavy metal ions on gel forming properties of agaroids.]**
Stavrov, S. N.; Babin, B. N.
***Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya*** No. 2, 55-58 (1975) [7 ref. Ru] [Kishinevskii Ordena Trudovogo Krasnogo Znameni Gosudarstvennyi Univ. im. V. I. Lenina, USSR]

Samples of agaroids containing ions of Mn, Pb, Ni, Co, Zn, Cu, Al or Fe are hydrolysed in water according to the type of salts (weak bases and strong acids); they may be arranged in declining order according to the pH value of the 4% solutions. During boiling the agaroid hydrolysis is accompanied by hydrolysis of ester-bound sulphate groups and by the fragmentation of molecules. The Cu-, Zn-, Al- and Fe-agaroids do not form gels. The gels of the remaining ions may be arranged according to their firmness as follows: Mn-, Pb-, Ni-, Co-agaroid. At concn. >4% the firmness of the Pb-agaroid gel drops below that of Co-agaroid. Weak base salts and strong acid salts reduce the firmness of the gels formed due to pH reduction. STI

## 59

**Automated wet ashing and multi-metal determination in biological materials by atomic-absorption spectrometry.**
Frank, A.
***Zeitschrift für Analytische Chemie*** **279** (2) 101-102 (1976) [1 ref. En] [Nat. Vet. Inst., Stockholm, Sweden]

A commercially available wet ashing apparatus (Tecator AB, Helsingborg, Sweden) was modified by mounting a synchronous timing motor with a suitable gearbox on the front panel of the thermostat unit; this modification allows adjustment of the heating profile to suit different oxidizing mixtures and types of biological material. The material to be analysed is ashed with acidic oxidizing mixtures and the digested acidic solution obtained is subjected to AAS for detn. of various metals, e.g. Cd, Cu, Fe, Mn, Zn, Pb. The method is suited to wide metal concn.; examples of its use include diagnosis of heavy metal poisoning in animals and study of environmental pollution by heavy metals. JA

## 60

**[Novel method for the compensation of non-specific light losses in atomic-absorption spectroscopy.]**
Eine neuartige Methode der Kompensation unspezifischer Lichtverluste in der Atomabsorption-Spektroskopie.
Dujmovic, M.; Adrian, P.; Knoezinger, E.
***Zeitschrift für Analytische Chemie*** **272** (3) 177-181 (1974) [De] [Abteilung Anwendungstech., Beckman Instruments GmbH, Munich, Federal Republic of Germany]

After a brief discussion of light losses in AAS, a system for detn. of specific and non-specific light losses (including rapidly varying losses) is

described. Applications discussed as examples include detn. of Pb in milk or blood, using a graphite cell.  AJDW

## 61

**Environmental quality and safety. Supplement Vol. I. Heavy metal toxicity, safety and hormology.** [Book]
Luckey, T. D.; Venugopal, B.; Hutcheson, D. P.
120pp. ISBN 3-13-516301-6 (Georg Thieme); ISBN 0-12-227061 (Academic Press) (1975) [many ref. En] Stuttgart, Federal Republic of Germany; Georg Thieme Publishers & New York, USA; Academic Press. Price DM35 [Univ. of Missouri, Columbia, Missouri 65201, USA]

Chapters in this book are: Introduction, by T. D. Luckey (pp. 1-3); Toxicology of non-radioactive heavy metals and their salts, by B. Venugopal & T. D. Luckey (pp. 4-73); Safety of heavy metals as nutritional markers, by D. P. Hutcheson, D. H. Gray, B. Venugopal & T. D. Luckey (pp. 74-80); Hormology with inorganic compounds, by T. D. Luckey (pp. 81-103); and References (pp. 104-118). [See FSTA (1974) **6** 11A499 & 11A500 for Vol. II.]  AL

## 62

**[The food chain and bioaccumulation.]** [Review]
Yoshida, T.
***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** **16** (6) 345-351 (1975) [56 ref. Ja] [Tokyo Univ. of Fisheries, Konan 4-5-7, Minato-ku, Tokyo, Japan]

General features of bioaccumulation of chemical substances in the food chain are reviewed, emphasis being placed on marine life, the mechanisms of bioaccumulation, and newly developed methods for detecting chlorinated hydrocarbons and heavy metals.  TM

## 63

**[An attempt to estimate the total daily intake of pesticide and polychlorinated biphenyl (PCB) residues and trace heavy metals.]**
Ushio, F.; Fukano, S.; Nishida, K.; Kani, T.; Doguchi, M.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **25**, 307-312 (1974, publ. 1975) [15 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo 160, Japan]

An estimation was made of the dietary intake of pesticide and PCB residues and of Hg, Cd and Pb by 20-29 yr-old males. Foods representing a 4-day diet were collected from stores in Tokyo. Uncooked foods were divided into 4 food groups (cereals; fish and shellfish; meat and dairy products; vegetables and seasonings) and subjected to analysis. The average daily intake of the substances was calculated as: PCB 8 μg, total BHC 3.5 μg, total DDT 4.7 μg, dieldrin 1.7 μg, Hg 35 μg, Cd 38 μg, and Pb 205 μg.  AS

## 64

**[DDTC-MIBK (diethyl-dithiocarbamate (sodium (sodium salt)/methyl isobutyl ketone) extraction system for simultaneous determination of heavy metals in foods by atomic absorption spectrophotometry. I. Determination of chromium in foods containing a large amount of calcium and phosphate.]**
Nishigaki, S.; Tamura, Y.; Maki, T.; Yamada, H.; Toba, K.; Shimamura, Y.; Kimura, Y.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **24**, 231-237 (1972, publ. 1973) [27 ref. Ja, en] [Div. of Food Hygiene, Dep. of Food Hygiene & Nutr., Tokyo Metropolitan Res. Lab. of Public Health, Tokyo, Japan]

In foods containing large amounts of Ca and phosphate, the DDTC-MIBK extraction method can be employed prior to Cr detn. by AAS provided ammonium persulphate is employed for oxidation of Cr. The pH of the Cr-DDTC complex should be adjusted with a buffer solution for extraction with MIBK. The limit of detection of the method is 0.01 ppm. Tabulated data [in English] show the levels of Cr, Cd, Pb, Cu, Zn and Co found in various types of fish and shellfish, milk and milk powder, bacon and vegetable protein. [From En summ.]  JA

## 65

**[Hygienic chemical studies on harmful elements. V. Contents of heavy metals in vegetables and fruits.]**
Amemiya, T.; Ito, K.; Yamazoe, R.; Harada, H.; Totani, T.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **25**, 127-132 (1974, publ. 1975) [18 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo 160, Japan]

A survey was made in 1971-1973 of the contents of Cd, Pb, As, Cu, Zn and Mn in tomato, cucumber, spinach, potato, tea, apple, strawberry and summer orange collected from retail outlets. The samples were digested with sulphuric and nitric acids. The elements were then determined in the digested solution by spectrophotometry, using silver diethyldithiocarbamate and AAS. Ranges and mean values for the 3 yr are tabulated [in English]. [From En summ.] [See FSTA (1973) **5** 3C76 for part II.]  JA

## 66

**General population exposure of stable lead and $^{210}$Pb to residents of New York City.**
Bogen, D. C.; Welford, G. A.; Morse, R. S.
***Health Physics*** **30** (4) 359-362 (1976) [10 ref. En] [Health & Safety Lab., US. Energy Res. & Development Admin., New York, New York 10014, USA]

During 3 surveys carried out in 1968-1973, annual intake (mg/yr) of stable lead from 19 food product categories, which comprise a standard diet in the USA, was calculated. Results for the 1972-1973 survey were as follows (grouped into general

food categories): 20.3 from carbohydrate foods, 6.9 from protein foods, 3.2 from dairy products, and 1.1. from dried foods. Corresponding values for intake of $^{210}$Pb were (pCi/yr): 276.4, 58.1, 58 and 51.8. Average stable lead concn. in tap water was 4 μg/l. vs. 0.04 pCi $^{210}$Pb/l. Mass balance of intake vs. excretion data shows only 5 μg/day of stable lead and 0.1 pCi/day of $^{210}$Pb are retained in the body. MC

## 67

**[Hygienic-chemical studies of rubber utensils. I. Lead and zinc contents of rubber teats of nursing bottles.]**

Nishida, S.; Kobayashi, H.

***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **24**, 167-171 (1972, publ. 1973) [6 ref. Ja, en] [Div. of Microanalysis, Dep. of Chem., Tokyo Metropolitan Res. Lab. of Public Health, Tokyo, Japan]

The standard alkaline digestion method gave negative results for the presence of Pb but positive results for Zn. Using 4% acetic acid for extraction followed by AAS, 0.10-1.70 ppm Zn was found (mean 0.60 ppm); no Pb was detected by this method. Wet digestion followed by quantitative analysis by the dithizone method indicated Pb contents of 0.90-7.60 ppm (mean 4.20 ppm). Hot water extraction gave negative results for Pb and indicated Zn levels of 0.10-0.50 ppm. [From En summ.] JA

## 68

**The substoichiometric extraction system MIBK/APDC and its application to the direct determination of Pb and Cd in wine.**

Anders, U.; Hailer, G.

***Zeitschrift für Analytische Chemie*** **278** (3) 203-206 (1976) [32 ref. En, de] [Chem. Landesuntersuchungsanstalt, Hedingerstrasse 2a, Sigmaringen, Federal Republic of Germany]

The insolubility of sugars and fruit acids in methyl isobutyl ketone (MIBK) allows direct extraction of heavy metals by ammonium pyrrolidine dithiocarbamate (APDC) from wine and similar products. A method is described allowing detn. of 0.1-1 ppm Pb and 1-10 parts/billion Cd with ±5% accuracy. Ethanol concn. of 4-20% or use of a buffer had no effect on accuracy, inside the 5% margin of error. Reduction of the extraction time (25 min agitation and 15-20 min centrifugation at 5000 rev/min) increased the average error to -5 to -20%. A literature survey is included. RM

## 69

**[Correlation between the amount of industrial dust fall and the lead and zinc accumulation in some plant species.]**

Kazmierczakowa, R.

***Bulletin de l'Academie Polonaise des Sciences, Sciences Biologiques*** **23** (9) 611-621 (1975) [10 ref. En, ru] [Dep. of Nature Conservation, Polish Acad. of Sci., Lubicz 46, 31-512 Cracow, Poland]

A positive linear correlation between the amount of dust fall from Pb and Zn works in S. Poland and the Pb and Zn concn. in plants from a pine forest habitat was found. The study also showed that Pb and Zn concn. in the DM of fruits Vaccinium vitis-idaea were some 12- and 10-fold lower respectively than in the shorts from which fruits were collected and several dozen and 20-fold lower respectively than in underground parts of the plant. AL

## 70

**Physical-chemical characteristics and heavy metal content of corn grown on sludge-treated strip-mine soil.**

Garcia, W. J.; Blessin, C. W.; Inglett, G. E.; Carlson, R. O.

***Journal of Agricultural and Food Chemistry*** **22** (5) 810-815 (1974) [6 ref. En] [N. Regional Res. Lab., USDA, Peoria, Illinois 61604, USA]

Corn was grown on strip-mine soil where anaerobically digested liquid sludge had been applied at a rate of 25 tons of sludge solids/acre. An adjacent plot of soil received no sludge. Corn grain grown on untreated strip-mine soil was characterized as immature and kernel size varied from small to intermediate, with about 20% of the kernels being diseased. In contrast, sludge-grown corn was well developed and corn yield increased fourfold over the untreated corn. Furthermore, a significant protein enhancement of 2.5% points was also realized. Concn. of 7 heavy metals (Zn, Mn, Cu, Pb, Cr, Cd, Hg) increased in grain, cobs, and husks in that order. For corn grain grown on untreated and sludge-treated soils, essentially no significant differences were found in heavy metal content when compared to 11 other corn var. grown normally. Heavy metal contents of both soil and sludge samples were also determined. AS

## 71

**[Basic problems in achieving healthy nutrition. II. Effect of exhaust gases on lead and cadmium contents of green feeds, milk and excreta.]**

Grundsatzfragen zur Erzeugung einer gesunden Ernährung. II. Einfluss von Kraftfahrzeugabgasen auf den Blei- und Cadmiumgehalt von Grünfutter, Milch und Exkrementen. [Lecture]

Schmid, G.; Rosopulo, A.; Weigelt, H.

***Landwirtschaftliche Forschung*** Sonderheft 31/II, 150-159 (1975) [4 ref. De, en, fr] [Bayerische Landesanstalt für Bodenkultur & Pflanzenbau, München-Freising, Federal Republic of Germany]

During May-Oct. 1973, 30 cows were on (i) a high mountain pasture (altitude, 1200 m) not exposed to motor traffic, while 30 other cows were on (ii) a pasture adjacent to a busy Inntal motorway. Pb content of (i) pasture ranged from 5.3 to 7.3 ppm in DM, while that of (ii) increased from 3.5 ppm in DM initially to 13.6 ppm. Cd contents of (i) and (ii) showed similar ranges (0.09-0.17 and 0.08-0.15 ppm in DM respectively). There was no differences in Pb contents of (i) and (ii)

milks (means and ranges 30 and 20-40 μg/l. in both) or in Cd contents (means 1.2 μg/l.; ranges 1.0-1.5 and 1.0-1.4 μg/l. respectively). SKK

## 72

**Analysis of lead in evaporated milk by flameless atomic absorption spectroscopy.**

Huffman, H. L., Jr.; Caruso, J. A.

***Journal of Agricultural and Food Chemistry*** **22** (5) 824-827 (1974) [25 ref. En] [Dep. of Chem., Univ. of Cincinnati, Cincinnati, Ohio 45221, USA]

A procedure for determining Pb in canned evaporated milk by flame atomic absorption and the flameless atomic absorption technique using the tantalum ribbon and carbon-cup atomization devices is evaluated. A fairly rapid pre-ashing procedure to eliminate the mechanical loss of Pb encountered during the dry-ash sequence of the flameless method is described. A least-squares fit of the data taken using the method of standard additions is used to determine the Pb in each sample. The results from the analyses of actual samples taken from supermarket shelves fall within the federal guideline of <0.5 ppm. AS

## 73

**[Studies on the accumulation of trace elements in fish. II. Relationship between body weight and concentrations of copper and zinc in muscle of sea fish.]**

Nishigaki, S.; Tamura, Y.; Maki, T.; Yamada, H.; Shimamura, Y.; Kimura, Y.

***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **25**, 241-244 (1974, publ. 1975) [13 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo 160, Japan]

The concn. of Cu and Zn in muscle tissue generally remained constant or decreased with increased body weight of tuna and swordfish. The contents of Cr, Cd, Pb, Cu, Zn and As in various species of sea fish are tabulated [in English]. [From En summ.] JA

## 74

**[Study of trace elements in marine fish. I. Distribution of heavy metals in bonito tissue.]**

Katsuki, Y.; Yasuda, K.; Ueda, K.; Kimura, Y.

***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **25**, 257-263 (1974, publ. 1975) [27 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo 160, Japan]

5 freshly caught bonitos, 52-55 cm long, which had been caught in Japanese coastal waters were studied for the distribution of heavy metals in their organs and muscles. Mn, Pb, Co, Cd, Cu, Cr, Zn and total and methyl mercury were detected and determined by AAS and GLC. Results are tabulated [in English]. Hg tended to accumulate in muscle rather than in internal organs and averaged 0.29 ppm in muscle; about 90% was present as methyl mercury. Heavy metals other than Hg tended to accumulate in the internal organs rather than in muscle. [From En summ.] JA

## 75

**Metal contaminants in various food colours.**

Khanna, S. K.; Singh, G. B.; Hasan, M. Z.

***Journal of the Science of Food and Agriculture*** **27** (2) 170-174 (1976) [26 ref. En] [Ind. Toxicology Res. Cent., Mahatma Gandhi Marg, Post Box No. 80, Lucknow, Uttah Pradesh, India]

As, Cd, Cr, Co, Cu, Pb, Mn, Ni and Zn were estimated in 18 permitted and 18 non-permitted food colours. As, Cr, Cu and Pb were found to be within the max. allowable international limits in all the permitted colours, but they were in excess in a number of non-permitted colours. There is a case fo establishing the max. allowable concn. (MAC) of Cd, Co, Mn, Ni and Zn in food colours. AS

## 76

**[Detection of extractable heavy metals in glazed pottery, porcelain and enamel ware.]**

Fujii, T.; Sato, K.; Shiba, H.; Nakajima, S.; Yamato, O.

***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **23**, 253-259 (1971, publ. 1972) [3 ref. Ja, en] [Dep. of Food Hygiene and Nutr., Tokyo Metropolitan Res. Lab. of Public Health, Tokyo, Japan]

During the period April 1971-March 1972, 119 samples of glazed pottery and porcelain, and 48 samples of enamel ware were examined for extractable heavy metals. 3 glazed pottery samples and 1 enamel ware sample were found, on the basis of their extractable heavy metal content, to be unsuitable for use as table-ware, according to limits stipulated by the Japanese Food Sanitation Law. In the USA, regulations require that table-ware should not release >7 ppm Pb and >0.5 ppm Cd when extracted with 4% acetic acid for 24 h at room temp. If this regulation were applied to the results of this study, 55 of the 119 glazed pottery and porcelain samples and 14 of the 48 enamel ware samples would be rejected. It is therefore recommended that the limit for extractable heavy metals, as stipulated in the Japanese Food Sanitation Law, be revised. AS

## 77

**Anodic stripping voltammetry - a new simple answer for lead residue analysis.**

Zink, E. W.; Askew, L. R.

***Food Product Development*** 9 (10) 48, 50, 54, 58-59 (1975) [18 ref. En] [Environmental Sci. Associates Inc., Burlington, Massachusetts, USA]

The technique of anodic stripping voltammetry (ASV) is reviewed. Capital expenditure required, accuracy, precision, and speed of analysis of ASV are considered. These criteria are then used to compare ASV with other suitable techniques with equivalent sensitivity for the measurement of trace metal residues (especially Pb) in food products and their containers. VJG

## 78

**[Determination of lead in musts, wines and vinegars.]**
Amati, A.; Minguzzi, A.; Rastelli, R.
***Scienza e Tecnologia degli Alimenti*** 6 (1) 39-41 (1976) [20 ref. It, en] [Istituto di Ind. Agrarie, Univ. di Bologna, Italy]

An AAS method, proposed as an official method in Italy and by the Office Internationale de la Vigne et du Vin (OIV), is described for detn. of Pb in musts, wines and vinegars. The method has an SD of 0.0095, a coeff. of variability of 2.82% and mean standard error of 0.003. Analysis of 65 Italian white and 55 red wines showed mean Pb contents of 0.26 (range, 0.06-0.68) and 0.21 (range, 0.03-0.55) mg/l., respectively. The level of Pb contamination is considered non-critical. HBr

## 79

**[Cadmium and lead in brewed coffee.]**
Stenström, T.; Vahter, M.
***Var Föda*** 27 (3) 150-156 (1975) [6 ref. Sv, en] [Omgivningshygieniska Avdelning, Naturvardsverk, S-104 01 Stockholm, Sweden]

Uptake of Cd and Pb by water during boiling was studied with 20 types of domestic coffee-making machine on sale in Sweden. The water used was of pH 8.3, and had initial Pb and Cd concn. of 0.6-0.8 μg/l. and 0.06 μg/l. respectively. Samples of one machine gave very high Cd concn. (≤99 μg/l.) in the boiled water; after daily use for 4 wk, it still gave a Cd concn. of approx. 40 μg/l. Another type gave very high Pb concn. (≤260 μg/l.). Sources of heavy metal contamination are discussed, with special reference to solder and Pb-containing brass. The potential health hazard from water containing Pb and Cd concn. of this order of magnitude is discussed. Losses of Cd from the water during infusion and filtration of tea and coffee were studied. 19-38% of the Cd in the water was present in the filtered coffee; 70-91% of the Cd in the water was present in the tea infusion. AJDW

## 80

**[Oligoelements in domestic and foreign wines.]**
Modi, G.; Guerrini, M.; Signorelli, L.
***Bollettino dei Laboratori Chimici Provinciali*** 27 (1) 28-48 (1976) [40 ref. It, de, en, fr] [Lab. Chimico Provinciale di Firenze, Florence, Italy]

The results of quantitative analyses of Cd, Pb, Fe, Cu and Zn concn. in 220 domestic and foreign wines are presented in tables and include: Cd mean 0.007 ppm, max. 0.023 ppm, 47 samples >0.01 ppm; Pb mean 0.264 ppm, max. 1.09 ppm, 39 samples >0.3 ppm; Fe mean 8.46 ppm, max. 30.45 ppm; Cu mean 0.348 ppm, max. 2.653 ppm, 6 samples >1 mg/l.; Zn mean 2.082 mg/l., 1 sample >5 ppm (7.381 mg/l.). Causes of Cd and Pb contamination and methods of elimination of the residues are discussed. RM

## 81

**Influence on the levels of heavy metals in soil and plant from sewage sludge used as fertilizer.**
Andersson, A.; Nilsson, K. O.
***Swedish Journal of Agricultural Research*** 6 (2) 151-159 (1976) [15 ref. En] [Dep. of Soil Sci., S-750 07 Uppsala 7, Sweden]

The effects of fertilization with sewage sludge on Mn, Zn, Cu, Ni, Co, Cr, Pb, Cd and Hg concn. in barley, oats and spring wheat were studied in pot and field trials. Tables of results are given. Application of sewage sludge increased concn. of Zn, Cu, Ni and Cd (but not the other heavy metals) in the grain. The suitability of sewage sludge for use as a fertilizer is discussed, with reference to the danger of uptake of significant concn. of heavy metals by food crops. AJDW

## 82

**[Testing of spices and condiments. Determination of lead. Photometric method.]** Prüfung von Gewürzen und Zutaten. Bestimmung von Blei. Photometrisches Verfahren.
**Germany, Federal Republic of,** Deutscher Normenausschuss
***German Federal Republic Standard*** **DIN-10227,** 2pp. (1974) [De]

The sample under test is digested with $HNO_3$ and $H_2SO_4$. Interfering phosphates are separated by precipitation, Fe is bound by addition of ammonium citrate, and other interfering metals are bound by addition of KCN. Pb is extracted with chloroform/dithizone, then re-extracted into dilute HCl. Chloroform, dithizone and ammoniacal $Na_2SO_3$/KCN solution are added, and the extinction value of the resulting solution is determined at 520 nm. Pb concn. is then calculated. AJDW

## 83

**[Short- and long-term studies on extraction of lead and cadmium from kitchenware.]**
Beckmann, I.; Sark, M.
***Var Föda*** **26** (9/10) 248-257 (1974) [10 ref. Sv, en] [Statens Livsmedelsverk, S-104 01 Stockholm, Sweden]

Release of Cd and Pb from glazed and enamelled kitchen utensils was studied; short-term tests were conducted by boiling 3 times with acetic acid (4 g/l.), and long-term tests were conducted by holding the vessel (filled with acetic acid solution) for 24 h at room temp. Studies were also conducted on extraction of Pb and Cd by citric acid solution or fruit juices. Tables of results are given. The boiling method tended to give higher values than the room temp. method. Citric acid and fruit juices gave similar results to acetic acid. During long-term storage trials, Cd and Pb concn. in the test solution increased continuously. It is suggested that food should not be stored in red, orange or yellow glazed or enamelled containers. AJDW

## 84

**[Protection from noxious substances in food as a duty of food control.]** Der Schutz vor Schadstoffen in der Nahrung als Aufgabe der Lebensmittelüberwachung.
Sperlich, H.
***Ernährungs-Umschau*** **22** (10) B37-B39; (11) B41-B43 (1975) [36 ref. De] [7000 Stuttgart 1, Postfach 1219, Federal Republic of Germany]

Possible sources of contamination of food are considered with particular reference to the occurrence of Pb, Hg, radioactive substances, mycotoxins and carcinogenic hydrocarbons on materials destined for human consumption. The practice by which bulk raw food materials are transported in containers previously used for transport of non-edible materials is strongly condemned, and an example, contamination of bakery flour with lime, is quoted. Atmospheric Pb contamination by petrol fumes is considered in the light of regulations reducing the permitted level in petrol from 0.6 to 0.4 g/l. The fallacy involved in the assumption that materials of natural origin are harmless is emphasized, with reference to toxins produced by microorganisms, e.g. botulinum toxin and aflatoxin. Introduction of legislation limiting the permissible content of aflatoxin in materials for human consumption to a value of 10 μg/kg is expected. The intake of noxious substances in small amounts, e.g. carcinogens and potential carcinogens, must be viewed in the context of the total exposure situation, since such items cannot be completely excluded from the diet. BDH

## 85

**Working party on the monitoring of foodstuffs for heavy metals. Fifth Report. Survey of lead in food: first supplementary report.** [Booklet]
**United Kingdom**, Ministry of Agriculture, Fisheries & Food
34pp. ISBN 0-11-240534-7 (1975) [En] London, UK; H.M. Stationary Office Price £0.50

Data obtained since the publication of the Second Report of the Working Party [see FSTA (1973) **5** 1C8] are presented. 3 appendices are included: Report of the Toxicity Sub-Committee of the Committee on medical aspects of chemicals in food and the environment (pp. 14-15); Report of the Food Additives and Contaminants Committee (p. 16); and Results of analyses (pp. 17-34). Appendix III presents the results of some 6000 analyses of foodstuffs, covering the period 1972 to 1974, and nearly 12 000 analyses of drinking water. Tables presented are: Pb in total diet samples; Estimation of the average daily intake of Pb; Pb in individual food items of the national.diet; Pb in canned fruit and vegetables; Pb in filleted fish landed in England and Wales 1972-1974; Pb in shellfish landed in England and Wales 1972-1974; Pb in prepared baby food; Pb in drinking water samples; Pb uptake of agricultural produce grown on soils with a naturally occurring high Pb content; Pb in Brassicae and rootcrops produced near a metal refining plant; Pb in vegetables and soft fruits grown near a metal refining plant; Pb in vegetables grown on land which has been treated with sewage sludge; and Pb in liver, muscle and milk from cattle reared on either sewage farm pastures, sludge amended pastures, or untreated pastures. VJG

## 86

**Lead in food.**
Anon.
***British Food Journal*** **78** (872) 72-74, 78 (1976) [2 ref. En]

The subject of Pb in food is discussed with reference to a recent report [see preceding abstr.] and the Report of the Food Additives and Contaminants Committee on the Lead in Food Regulations, 1961. JRR

## 87

**[Lead and cadmium contents of foods. I. Lead and cadmium contents of spices and table salt.]** Blei und Cadmium-Gehalte von Lebensmitteln. I. Blei- und Cadmium-Gehalte von Gewürzen und Kochsalz.
Boppel, B.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **160** (3) 299-302 (1976) [7 ref. De, en] [Inst. für Strahlentech., Bundesforschungsanstalt für Ernährung, Engesserstrasse 20, D-7500 Karlsruhe 1, Federal Republic of Germany]

The Pb and Cd contents were determined in >50 commercially available spices and spice mixtures obtained from various manufacturers and in 14 samples of table salt. Ranges of Pb found (ppm) were: spices, 0.04-4.8; salt, 0.03-1.8; and of Cd (ppm): spices, below the detection level (0.004 ppm)-1.5; salt, below the detection level-0.01. About 75% of the spices contained <1 ppm Pb and about 60% <0.1 ppm Cd. Savory, ginger, dill and tarragon all contained >1 ppm Pb and >0.1 ppm Cd. JA

## 88

**[Lead and cadmium contents of foods. II. Lead and cadmium contents of commercially prepared soups.]** Blei- und Cadmium-Gehalte von Lebensmitteln. II. Blei- und Cadmium-Gehalte von Fertigsuppen.
Boppel, B.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **161** (2) 111-113 (1976) [3 ref. De, en] [Inst. für Strahlentech., Bundesforschungsanstalt für Ernährung, Engesserstrasse 20, D-7500 Karlsruhe 1, Federal Republic of Germany]

Pb and Cd contents were determined in 30 commercially prepared soup products (soup powders and cubes) from several manufacturers. The mean Pb content was 0.28 ppm. 29 samples contained between 0.095 ppm and 0.45 ppm, 1 sample contained 1.4 ppm. The mean Cd content in 21 products was 0.025 ppm (highest value 0.052 ppm). In the other samples Cd was not found (<0.004 ppm Cd). AS

## 89

**[Determination of trades of lead and cadmium in aperitifs by flameless AAS.]**
Ooghe, W.; Kastelijn, H.
***Annales des Falsifications et de l'Expertise Chimique*** **69** (739) 351-367 (1976) [23 ref. Fr] [Lab. de Bromatologie, Inst. de Pharmacie, 135 De Pintelaan, B-9000 Ghent, Belgium]

The Pb content of 11 white and 17 red aperitifs, measured by flameless AAS after mixing 1 ml sample with 25 µl conc. $HNO_3$ and 100 µl 5% La solution (5.864 g $La_2O_3$ + 25 ml conc. $HNO_3$ in 100 ml), ranged from 40 to 261 µg/l. with a mean value of 127 µg/l. Cd, extracted from the samples with methylisobutylketone and 5% ammonium pyrrolidine dithiocarbamate, varied from 0.19 to 5.56 µg/l. with a mean value for the 28 samples of 1.42 µg/l. The levels of Pb and Cd found in the aperitifs were below the max. permitted levels for drinking water (300 µg Pb/l. and 10 µg Cd/l.). MEG

## 90

**Dependence of blood-lead on domestic water lead.** [Letter]
Elwood, P. C.; St. Leger, A. S.; Morton, M.
***Lancet*** **1** (7972) 1295 (1976) [3 ref. En] [MRS Epidemiology Unit (S. Wales), 4 Richmond Road, Cardiff CF2 3AS, UK]

Pb concn. were determined in drinking water samples from 745 houses in N. Wales; a table of results is given. 15% of water samples had Pb concn. higher than the current WHO recommended limit; 3 samples had Pb concn. ≥1.000 ppm. Blood Pb concn. of occupants of 109 of the houses were determined, and the regression of blood Pb on water Pb was determined. The regression coeff. was highly significant ($P < 0.01$), but regression accounts for only 13% of total variation in blood Pb. It is therefore concluded that tap water is a relatively unimportant source of Pb intake by humans. AJDW

## 91

**[Studies on the lead content of foods of plant origin in the vicinity of a lead-emitting plant.]**
Untersuchungen über den Bleigehalt pflanzlicher Nahrungsmittel im Wirkungsbereich eines bleiemittierenden Betriebes.
Auermann, E.; Jacobi, J.; Eternach, R.; Kühn, H.
***Nahrung*** **20** (5) 509-518 (1976) [20 ref. De, en, ru] [Hygiene-Inst. Karl-Marx-Stadt, German Democratic Republic]

Data are given (mean values and ranges, dry matter and fresh wt. basis) for the Pb concn. of samples of numerous types of fruit and vegetables grown in the vicinity of a Pb smelter in the German Democratic Republic. The max. Pb concn. recorded in fruit and in vegetables respectively were (pp. DM): 55 (in strawberries) and 158 (in lettuce). Leafy vegetables tended to have especially high Pb concn. All samples studied had Pb concn. 10 to 100 times higher than normal. The public health significance of these results is discussed. IN

## 92

**Determination of traces of heavy metals in oils and fats by arc spectrography.**
Farhan, F. M.; Pazandeh, H.
***Journal of the American Oil Chemists' Society*** **53** (5) 211-213 (1976) [12 ref. En] [Lab. of Physical Chem., Fac. of Eng., Univ. of Tehran, Tehran, Iran]

A new and simple method is described for direct and simultaneous determination of traces in fats and oils of Fe, Cu, Ni, Pb, Ag, Al, Mg, Ca and Mn. Graphite powder is used as spectroscopic buffer and for preparation of standard powders. Using necked cupped C electrode and cone shaped counter electrode, a steady DC arc discharge is obtained with graphite matrix. A quartz spectrograph of high resolving power is used for this determination. AS

## 93

**[Determination of lead in the presence of mercury in fish by the dithizone method.]**
Gajewska, R.; Nabrzyski, M.; Lipka, E.
***Bromatologia i Chemia Toksykologiczna*** **9** (1) 1-5 (1976) [9 ref. Pl, ru, en] [Akad. Med., Gdansk, Poland]

A modification of the wet mineralization method of Gorsuch [Analyst (1959) **84**, 135] was used for detn. of Pb in the presence of Hg in various var. of fish by the dithizone method according to Hordynska et al. [see FSTA (1970) **2** 4M322] for Hg present in concn. >2 µg/sample, and according to Nabrzyski [see FSTA (1974) **6** 6A223] for Hg concn. <2 µg/sample. Mean recovery of added Pb in 4 cod samples was 95% and in 10 miscellaneous fish samples (pike-perch, herring, cod, bream) 99 ± 8.3%. Correct adjustment of the test solution's pH to 9.0-9.5 is essential. HBr

## 94

**[Determination of lead in saltwater and freshwater fish.]**
Gajewska, R.; Nabrzyski, M.; Lipka, E.; Gajewski, A.
***Bromatologia i Chemia Toksykologiczna*** **9** (1) 7-12 (1976) [8 ref. Pl, ru, en] [Akad. Med., Gdansk, Poland]

The method of Gorsuch as modified by Hordynska et al. [see preceding abstr.] was used to determine the Pb contents of 403 samples of saltwater fish (cod, herring, flounder, sprat, garfish, Greenland halibut, Drepanopsetta platessoides, Pleuronectes cynoglossus and Argentina), 25 samples of cod liver and 156 samples of freshwater fish (bream, white bream, roach, eel, pike, salmon, tench, perch and pike-perch). The fish were caught during 1972-1974 in the southern Baltic, north Atlantic and in Polish domestic waters. Pb concn. found (mg/kg tissue) ranged from 0.020 to 1.330 in the saltwater fish and from 0.150 to 1.400 in the cod liver and from 0.020 to 2.640 in the freshwater fish. Only 2 freshwater fish samples exceeded the Polish permissible limit of 2 mg/kg. HBr

## 95

**[Cadmium and lead in the livers and kidneys of slaughter animals.]**
Beckman, I.; Haegglund, J.; Lundström, H.; Sark, M.; Slorach, S.
***Var Föda* 26** (4) 70-75 (1974) [13 ref. Sv, en] [Statens Livsmedelsverk, S-104 01, Stockholm, Sweden]

Pb and Cd concn. were determined in kidney and liver samples from (i) 9 calves, (ii) 28 adult cattle, (iii) 12 pigs, (iv) 16 sheep, (v) 1 foal and (vi) 13 adult horses. A table of results is given. Mean values for Pb concn. were, in kidney and liver respectively (mg/kg): (i) 0.32 and 0.33; (ii) 0.59 and 0.40; (iii) 0.26 and 0.26; (iv) 0.51 and 0.56; (v) 0.3 and 1.5; and (vi) 0.38 and 0.34. Corresponding values for Cd were (mg/kg): (i) 0.25 and 0.06; (ii) 0.62 and 0.11; (iii) 1.02 and 0.12; (iv) 0.43 and 0.34; (v) 0.04 and 0.04; and (vi) 31 and 2.6. The significance of these results is discussed, in relation to the suitability of these foods for human consumption. It is concluded that, with the exception of horse kidneys, all these foods are suitable for human consumption. AJDW

## 96

**[The lead and cadmium content of meat and organ samples from slaughter animals.]** Untersuchungen auf den Gehalt an Blei und Cadmium in Fleisch- und Organproben bei Schlachttieren.
Holm, J.
***Fleischwirtschaft* 56** (3) 413-416 (1976) [24 ref. De, en, fr] [Staatliches Veterinäruntersuchungsamt, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

The lean meat, livers and kidneys of cows, bullocks, bulls, calves, pigs, sows (50 samples of each) and of 28 horses, and livers and kidneys of 50 hares were examined for Pb and Cd and results tabulated. Except for Cd in horse meat (0-1.503 ppm, mean 0.148), the concn. of both metals in meat was low and well below the max. tolerances. Appreciable numbers of animals had concn. > the suggested max. of 0.5 ppm in liver and/or kidneys. Individual animals had high Pb concn. in liver, and/or high Cd concn. in kidneys. Cd contamination was mainly observed in kidneys of cows, pigs, sows, hares and especially in horses (0.79-369.56 ppm, mean 52.49). Hare livers were heavily contaminated with Pb (0.92-3.82 ppm, mean 1.75). While correlation coeff. for the metal concn. in liver with concn. in meat or kidney were low, high correlations were observed between Pb concn. in beef liver and in muscle or kidneys in cases of Pb poisoning. Owing to the high Cd concn. observed, consumption of kidneys from cows, pigs, sows and horses and hare livers is discouraged. RM

## 97

**Detection and determination of lead in whole and ground turmeric and curry powders.**
Kulkarni, B. M.; Chourasia, L. O.; Nair, K. M. G.; Mathew, T. V.
***Research and Industry, India* 20** (4) 210-212 (1975) [7 ref. En] [Cent. Agmark Lab., Nagpur, India]

Spice samples (1.0 g) were treated with concn. HCl to dissolve all Pb, filtered and the alkaline filtrate treated with 0.01 mg of dithizone (dipenyl thiocarbazone) in 0.5 ml chloroform. Pb caused a red coloration, even in a sample containing 1 µg/g. Comparison of test samples or turmeric with a prepared standard containing 2.5 µg/g (the max. permitted) allows assessment of the quality of the spice. In curry powder, the limit is 10 µg/g. JRR

## 98

**[Pb in foods stored in earthenware containers.]**
Beckman, I.; Guthenberg, H.
***Var Föda* 26** (9/10) 242-247 (1974) [3 ref. Sv, en] [Statens Livsmedelsverk, S-104 01 Stockholm, Sweden]

Studies were conducted on uptake of Pb by foods held in containers with excessively high Pb-release values. Samples studied included orange drink, filmjölk, sliced beetroot or lemon drink held in the containers for ≤1 wk at room temp.; and tea and coffee infusions cooled from boiling point to room temp. in the vessels under test. A table of results is given. Uptake of Pb by the filmjölk, beets, lemon drink, tea and coffee remained within the Swedish tolerance (3 mg/l.); orange drink held in a mug with a very high Pb-release value (333 mg/l. vol of the vessel) accumulated very high Pb concn. (≤165 mg/l.). AJDW

## 99

**Trace substances in environmental health - VIII. Proceedings of the University of Missouri's 8th Annual Conference, held at Memorial Union, University of Missouri-Columbia, June 11, 12 and 13, 1974.** [Conference proceedings]
Hemphill, D. D. (United States of America, Missouri University, Environmental Trace Substances Center & Extension Division) (Editor)
xv + 457pp. (1974) [many ref. En] [Columbia, Missouri, USA]

Papers read at the conference are presented, including the following: The epidemiology of natural teratogens, by J. H. Renwick (pp. 3-8, 15 ref.), which makes reference to the occurrence of L-goitrin in rutabagas and other Brassicae; The ratio of zinc to copper in milk and mortality due to coronary heart disease: an association, by L. M. Klevay (pp. 9-14, 37 ref.); Lead in air, dustfall, soil, housedust, milk and water: correlation with blood lead of urban and suburban school children, by C. R. Angle, M. S. McIntire & A. V. Colucci (pp. 23-29, 6 ref.); Selective determination of chromium in biological and environmental matrices [including bovine liver], by L. T. McClendon (pp. 255-257, 10 ref.); The mechanism of methylmercury transport and transfer to the tissues of the rainbow trout (Salmo gairdneri), by F. J. Giblin & E. J. Massaro (pp. 349-355, 13 ref.); and Effects of dietary supplements of copper, sulfate and molybdate upon liver and kidney concentrations of ten minerals in young chickens, by E. W. Kienholz, W. R.

Chappell, R. R. Meglen & H. Rudolph (pp. 373-378, 23 ref.). Discussions of the papers are included. A further 6 papers are abstracted separately and listed in the FSTA author index under **United States of America, Missouri University [8th Trace Substances Symposium]**. [See FSTA (1976) **8** 7A337 for 6th symposium.] JA

## 100

**[Analysis of heavy metals in foods: problems of recovery.]** Das Problem der Rückgewinnung bei der Analyse von Schwermetallen in Lebensmitteln. [Review]
Pfannhauser, W.
***L und E*** **28** (4) 101-102 (1975) [De] [Forschungsinst. der Ernährungswirtschaft, Blaasstrasse 24, A-1190 Vienna, Austria]

## 101

**[Lead content of foodstuffs. III. Lead intake from total daily diets.]** Bleigehalte von Lebensmitteln. III. Blei-Aufnahme durch die tägliche Nahrung. [Lecture]
Boppel, B.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **158** (5) 287-290 (1975) [21 ref. De, en] [Inst. für Strahlentech., Bundesforschungsanstalt für Ernährung, Karlsruhe, Federal Republic of Germany]

Daily consumption of different food items (meat, fish, vegetables, cereals, cheese, eggs, beverages including coffee with milk, etc.) of 4 adult males was measured for 1 wk. Exact duplicates of the items provided by each subject were compounded daily, ashed, and Pb was determined by AAS. The individual daily Pb intake ranged from 73 to 236 µg; the overall mean was 121 µg. [See FSTA (1974) **6** 4H503 for part II.] SKK

## 102

**[Lead content of foodstuffs. IV. Lead content of infant foods.]** Blei-Gehalte von Lebensmitteln. IV. Blei-Gehalte von Baby-Fertignahrung. [Lecture]
Boppel, B.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** **158** (5) 291-294 (1975) [10 ref. De, en] [Inst. für Strahlentech., Bundesforschungsanstalt für Ernährung, Karlsruhe, Federal Republic of Germany]

120 jars or packages of infant foods covering 53 different items including vegetable, fruit, meat, milk or cereal preparations alone or combined were analysed in duplicate for Pb by AAS after ashing. Separate values are tabulated; approx. 75% were <100 µg Pb/kg product and the ramaining 25% (>100 µg Pb/kg product) were for dried products used in preparations of milk formulae and vegetable dishes containing varying proportions of spinach. Intake/wk of a 6-months-old infant fed exclusively on commercial infant foods was approx. 320 µg Pb (approx. 45 µg/kg body wt.). SKK

## 103

**Heavy metal exposure from foods.**
Mahaffey, K. R.; Corneliussen, P. E.; Jelinek, C. F.; Fiorino, J. A.
***Environmental Health Perspectives*** No. 12, 63-69 (1975) [5 ref. En] [FDA, 200 C Street S.W., Washington, DC 20204, USA]

The FDA has a continuing programme of monitoring foods for their content of Pb, Cd, Hg, Zn, As, and Se to determine trends of increasing or decreasing levels. The monitoring protocol is that of the Total Diet Study, in which 'market baskets' of typical foods and beverages consumed by 15-20-yr-old American males are collected in various geographical locations at regular intervals during the yr, divided into food classes, composited, and analysed. Cd has the most widespread distribution of the 6 heavy metals and Hg the most limited. The analytical values for Pb may be underestimated because of limitations of the methodology; these do not apply to the other 5 elements. A tabulation by yr shows that the levels of these elements in foods do not vary significantly from one yr to the next. Average intakes of Pb, Cd, and Hg are below the WHO/FAO tolerable intakes for adults; such tolerable intakes have not been established for As and Se. Increases in concn. of these elements in foods would be considered undesirable, however. AS

## 104

**[Basic questions on the production of wholesome foods. III. Effect of compost prepared from municipal wastes and of sewage sludge on the heavy metal content of edible plants.]** Grundsatzfragen zur Erzeugung einer gesunden Ernährung. III. Einfluss von Müllklarschlammkompost und Klärschlamm auf den Schwermetallgehalt von Nahrungspflanzen. [Lecture]
Schmid, G.; Rosopulo, A.; Weigelt, H.
***Landwirtschaftliche Forschung*** Sonderheft 31/II, 191-205 (1975) [12 ref. De, en, fr] [Bayerische Landesanstalt für Bodenkultur & Pflanzenbau, Munich, Federal Republic of Germany]

Field trials were performed with sewage sludge and compost from municipal wastes applied at 100-2000 $m^3$/ha. Effects on uptake of Mn, Cu, Zn, Pb, Cd, Cr and Hg were studied in sugar beets, potatoes summer and winter wheat, barley and oats. Tabulated results showed that in comparison with untreated controls, uptake of Mn was reduced by about 50% and Cr uptake was increased by >100% while, with few exceptions, the uptakes of other metals showed no significant changes. Since no legal tolerances have been established by the Federal Health Office, no statement can be made on the harmful effect of the observed metal concn. [See FSTA (1976) **8** 9P1680 for part II.] RM

## 105

**The implication of the transfer of trace metals from sewage sludge to man.** (In 'Trace substances in environmental health - VIII' [see FSTA (1976) 8 12A698].) [Lecture]
Nelmes, A. J.; Buxton, R. S. J.; Fairweather, F. A.; Martin, A. E.
pp. 145-153 (1974) [26 ref. En] [Div. of Environmental Pollution & Chem. Contamination of Food, Dep. of Health & Social Security, Alexander Fleming House, London, UK]

25 trace elements have been detected in sewage sludges, and of these Pb and Cd are of particular importance in relation to the extent to which they may constitute a hazard to health (by direct or indirect transfer to man). The trace metal content of sludges depends on both the quantity and quality of domestic sewage and industrial effluent; after deposition on soil, their availability to plants and groundwater varies with the physical and chemical properties of the soil. Pb and Cd were found to accumulate in farm soil heavily treated with sewage and undigested sludge but not in grassland regularly receiving low does of liquid sludge. Pb and Cd may reach man via food of either animal or vegetable origin. The contribution of these toxic metals to the total dietary intake of man in England and Wales is at present considered to be acceptably low. Studies on cattle grazed on sludge-treated pastures did not show a significant increase in the total Pb or Cd content of milk or muscle when compared with samples from cattle fed untreated pasture. The liver Pb and Cd content of cattle from treated pastures did not indicate that this meat was unfit for human consumption. AS

## 106

**Effect of a smelter on the agricultural conditions in the surrounding environment.** (In 'Trace substances in environmental health - VIII' [see FSTA (1976) 8 12A698].) [Lecture]
Lagerwerff, J. V.; Brower, D. L.
pp. 203-212 (1974) [32 ref. En] [Agric. Environmental Quality Inst., USDA, Beltsville, Maryland, USA]

Samples of human blood and hair, animal blood and milk, home-produced vegetables and house dust were gathered and analysed for Pb and Zn and in a few instances for Cd. The samples were drawn from areas of both high and low exposure to fallout from a smelter. The Pb content was significantly ($P > 0.95$) higher in home produce, milk and human and animal blood in high than in low exposure areas. Cd followed a similar trend in produce and house dust. It is conservatively estimated that persons living in the area of high exposure ingested Pb and Cd at rates >50% above those associated with 'normal' dietary intake of these metals. [See also FSTA (1976) **8** 7C329.] AS

## 107

**[Causes of excessive lead contents in wine, and preventive measures.]**
Botta, G.
***Industrie delle Bevande*** **5** (3) 109-112 (1976) [6 ref. It] [Societa Plastocoat, Turin, Italy]

Contamination of grapes and wine with Pb is discussed, with special reference to possible sources of contamination (soil, air, vine treatments, winemaking equipment, protective tank lacquers, bottles, capsules). The toxicological significance of Pb in wine is discussed, and changes in the Pb concn. during fermentation, clarification, etc. are considered. AJDW

## 108

**[Heavy metal content in sediment samples taken from a drinking-water reservoir.]** Untersuchungen über den Schwermetallgehalt im Sediment einer Trinkwassertalsperre.
Mihm, U.; Botzenhart, K.; Noeske, K.
***Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IB*** **162** (1/2) 205-210 (1976) [5 ref. De, en] [Hygiene-Inst., Univ. Bonn, Bonn, Federal Republic of Germany]

Sediment samples from the preliminary catchment basin of the Wahnbachtal reservoir were analysed for heavy metals (Fe, Zn, Mn, Pb, Cu, Cr, Cd). The upper (i.e. most recent) layers of sediment contained increased concn. of Zn, Mn, Pb, Cu, and Cd; this increased heavy metal concn. is attributed to Zn and Pb ores in the catchment area. The possibility of re-mobilization of heavy metals in these sediments and their liberation into the drinking water supply is briefly considered. AJDW

## 109

**[Studies on the changes in heavy metal contents during storage of commercial canned peach.]**
Lee, S. K.; Youn, J. E.; Hur, Y. H.
***Korean Journal of Food Science and Technology*** **7** (1) 1-6 (1975) [11 ref. Ko, en] [Dep. of Food Tech., Seoul Health Junior Coll., Seoul, S. Korea]

6 types of canned white peach in plain and lacquered cans were stored for ≤9 months at room temp. and monthly samples analysed for Sn, Pb and Fe. Results are tabulated and graphically presented. For lacquered cans, Sn concn. ranged from 45 ppm after 1 month's storage to 97 ppm after 9 months' storage. Pb concn. ranged from 0.8 to 1.0 ppm and Fe concn. from 1.2 to 1.8 ppm. For plain cans, Sn concn. ranged from 95.4 to 156 ppm, Pb concn. from 1.8 to 2.2 ppm and Fe concn. from 3.5 to 3.8 ppm. Metal levels in all 6 products were below the Korean legal limits. [From En summ.] CRI

## 110

**Lead, cadmium, zinc, copper and nickel distributions in vegetables and soils of an intensely cultivated area and levels of copper, lead and zinc in the growers.** (In 'Trace substances in environmental health - VIII' [see FSTA (1976) **8** 12A698].) [Lecture]
Hutchinson, T. C.; Czuba, M.; Cunningham, L.
pp. 81-93 (1974) [10 ref. En] [Dep. of Bot., Univ. of Toronto, Toronto, Ontario, Canada]

A study was made of an intensively cultivated horticultural area, in production for <40 yr since the drainage of the marsh from which it was formed. The muck soil varies in depth from 6 to 30 ft. Heavy applications of fertilizer and pesticides maintain high productivity. Distribution of trace heavy metals (Pb, Cd, Ni, Cu, Zn) in the soils, crops and people was studied. The effect of cultivation practices on metal accumulation was determined by comparisons with undrained parts of the marsh. Marked soil profile effects were seen for all metals, especially for Cu. Crop levels revealed that Cu was relatively tightly held in the organic soil compared with the other metals. Tabulated data give the concn. of each metal in leaves, roots, and, where appropriate, heads, tubers, flowers, grains and bulbs of lettuces, celery, cauliflowers, cabbages, oats, corn, radishes, potatoes, parsnips, carrots and onions harvested in spring and autumn. Metal concn. were higher in spring and autumn. Metal concn. were higher in spring than in autumn. Leafy crops, especially lettuce and celery, accumulated more Pb and Cd than did root crops. Pb levels were above normal. Fertilizers appeared to be a potential source of contamination. JA

## 111

**Lead contamination of air, soil, vegetation and people in the vicinity of secondry lead smelters.** (In 'Trace substances in environmental health - VIII' [see FSTA (1976) **8** 12A698].) [Lecture]
Roberts, T. M.; Gizyn, W.; Hutchinson, T. C.
pp. 155-166 (1974) [29 ref. En] [Inst. for Environmental Studies, Univ. of Toronto, Toronto, Ontario, Canada]

Pb contamination around 2 secondary Pb smelters located in urban areas was due mainly to large-particulate fallout from low level fugitive sources rather than stack fumes. Pb in monthly dustfall collections decreased exponentially with distance and consequently so did contamination of soil, vegetation and outdoor dust. Consumption of home-grown vegetables was not extensive but leaves and tubers of vegetables did accumulate significant amounts of Pb from fallout and soil respectively. Tabulated data give the Pb concn. in unwashed and washed lettuce leaves, radish roots and tomato fruit. As contamination of residential neighbourhoods was the result of Pb emissions over many years, control measures should include replacement of surface soil as well as a reduction of current emissions. Ongoing monitoring of Pb accumulation in turf transplanted into the contaminated area indicates that it will be ≥4-6 yr before levels become excessive again at the current rate of fallout. AS

## 112

**Metal ion removal.**
Danesh, A.
*United States Patent* 3 958 022 (1976) [En]

Heavy metal ions are removed from sea-food by washing with a complexing agent, followed by heating to volatilize the heavy metal ions. IFT

## 113

**[Suitability of shellfish for processing. II. Seasonal changes in heavy metal content of baby clam.]**
Lee, E. H.; Ryu, B. H.; Yang, S. T.
*Bulletin of the Korean Fisheries Society* 8 (2) 85-89 (1975) [8 ref. Ko, en]

Heavy metal content of baby clams from March 1973 to April 1974 in Depori, Samchunpo, Korea showed irregular monthly changes of Hg, Pb, Cu and Cd, but was relatively high in the summer season. Contents ranged as follows (ppm): Hg, 0.003-0.038; Pb, 0.096-0.921; Cu, 0.023-0.139; and Cd, 0.009-0.038, and the clams were considered suitable for processing. [From En summ.] VJG

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# CONTENT AND ANALYSIS OF LEAD IN FOODS

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H. BROOKES

ASSISTANT EDITOR

## 1

**[Atomic absorption spectrophotometric determination of lead, cadmium and copper in foods by simultaneous extraction of the iodides with methyl isobutyl ketone.]**
Tsutsumi. C.; Koizumi, H.; Yoshikawa, S.
***Japan Analyst [Bunseki Kagaku]* 25** (3) 150-154 (1976) [11 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric. & Forestry, 1-4-12, Shiohama, Koto-ku, Tokyo, Japan]

$Pb^{2+}$ (1-30 µg), $Cu^{2+}$ (1-30 µg) and $Cd^{2+}$ (0.2-6 µg) ions were quantitatively extracted as iodides from $H_3PO_4$ (4.25-5.0M) or $H_2SO_4$ (approx. 2.4M) solution containing KI (0.1-0.7M) with methyl isobutyl ketone (MIBK). The absorbance of $PbI_2$ after extraction with MIBK from acid solution containing 0.1M KI gradually decreased on standing, but showed little decrease when 0.7M KI was used and could be measured quantitatively even after one night. The simultaneous presence of 200 mg $Ca^{2+}$, 100 mg $Mg^{2+}$, 10 mg $Fe^{3+}$, $Mn^{2+}$, $Zn^{2+}$ and $Sn^{2+}$, 5 mg $Cu^{2+}$, $Pb^{2+}$, $Cd^{2+}$ and a mixture of 5 mg each Fe, Cu, Mn and Zn had no effect on the extraction of metal iodides from $H_3PO_4$, but >50 mg Ca or >5.0 g NaCl in 55 ml of the acid solution reduced the amount of $Pb\ I_2$ extracted from $H_2SO_4$. Recoveries of Pb, Cu and Cd in ashed solutions of foods (brown rice, wheat flour, corn, fruit juices) were 101-105, 97-104 and 97-100% respectively. Coeff. of variation for standard solutions of 5-25 µg Pb, 5-25 µg Cu and 1-5 µg Cd were 2.12-0.31, 0.716-0.291 and 1.36-0.215%, relative SD for ashed solutions of food containing 26-28 µg Pb, 16-21 µg Cu and 2-5 µg Cd were 0.77-0.37, 0.49-0.35 and 0.62-0.45% respectively. The method is rapid and simple and is applicable to detn. of Pb, Cu and Cd in nearly all kinds of food. AS

## 2

**[Dry ashing method for various foods for solvent extraction-atomic absorption spectrophotometry.]**
Tsutsumi, C.; Koizumi, H.; Yoshikawa, S.
***Japan Analyst [Bunseki Kagaku]* 25** (3) 155-160 (1976) [7 ref. Ja, en] [Nat. Food Res. Inst., Min. Agric. & Forestry, 1-4-12, Shiohama, Koto-ku, Tokyo, Japan]

In the detn. of trace metals by solvent extraction/AAS the sample solution was prepared by dry ashing. Cereal grains and their flours (brown and polished rice, barley, wheat, corn) to which the standard solutions of Cd, Pb and Cu were added, were ashed at 490°C and 540°C. The ashes were acid and generally contained residual C which absorbed some of the heavy metals, The heavy metals absorbed on the residual C were not eluted with variuous acid solutions, but were completely recovered when the residual C was decomposed with small amounts of $HClO_3$ and $HNO_3$. Heavy metals were lost when fruits and vegetables were completely ashed at 490° or 540°C. In order to keep the ash acid, $H_3PO_4$ was added to fruit and vegetable samples before ashing. No loss of Cd, Cu or Pb occured during dry ashing at 490°C. The anhydrous silica formed by dry ashing of barley did not absorb heavy metals if the acid solution was not filtered with filter paper. AS

## 3

**[A new instrument for ashing biological material, especially meat and meat products.]** Veraschung von biologischem Material, speziell Fleisch und Fleischwaren, mit einer neuartigen Fleischwaren, mit einer neuartigen Verbrennungsapparatur.
Mohadjerani, H.; Hauser, E.
***Fleischwirtschaft* 56** (2) 258-260 (1976) [3 ref. De, en] [Eidgenössisches Veterinäramt, Sektion Lebensmittelchemie, Viktoriastrasse 85, CH-3000, Berne, Switzerland]

A new instrument for incineration, especially suitable for heavy metal detn. in samples of animal origin, is described with the aid of a diagram. Complete mineralization is achieved in about 20 min. 10 replicate detn. of Pb and Hg in tunny gave excellent reproducibility (within 0.05 ppm) and much better recoveries than 4 other mineralization methods. Studies were also conducted on rabbit bones, and USA Standard Samples. RM

## 4

**[Lead and fluorine contents of agricultural products grown near a ceramic factory.]**
Mammi, F.; Manfredini, M.; Tognoni, E.
***Bollettino dei Laboratori Chimici Provinciali* 27** (5) 190-204 (1976) [19 ref. It, fr, en, de] [Lab. Chimico Provinciale di Reggio Emilia, Italy]

The Pb and F contents of samples of red and white wine and vegetables (lettuce, radishes, beetroot) grown in the neighbourhood of ceramic factories in Reggio Emilia were determined during 2 seasons, and results are tabulated. Apart from 2 very high results (2.20 and 1.05 ppm), the amounts of Pb in wine were only slightly higher than those normally reported, with a mean of 0.345 ppm, and 44.7% of samples above the 0.3 ppm tolerance limit, (vs. 0.21 ppm and 18.7% for a wider area). F contents were quite high, especially in wine from immediately adjoining vineyards, with 40% of samples containing 2-5 ppm (max. 9.5 ppm) and 65.6 and 86.2% containing more than the 1.5 ppm tolerance during the 2 seasons, respectively (vs. 20% from a wider area). Horticultural products contained normal levels of Pb (0.81-2.91 ppm in terms of DM) but 5-6 times the normal levels of F (28-140 ppm). RM

## 5

**[Daily intake of lead and zinc from food in the Netherlands and toxicological evaluation of the results.]**
Reith, J. F.; Engelsma, J. W.; Ditmarsch, W. C. van
***Voeding* 37** (9) 498-507 (1976) [52 ref. Nl, en] [Afd. Levensmiddelenleer, Rijksuniv. Utrecht, Zeist, Netherlands]

Pb and Zn were determined by AAS in samples of numerous foods (including carbohydrate-rich foods, dairy products, protein-rich foods, fat-rich foods, fruit and vegetables, nuts, beverages, canned foods, and foods packaged in plastics, glass or cardboard containers). Tables of values are given for Pb and Zn concn., together with calculated daily per capita intakes of Pb and Zn from the foods studied. Pb concn. ranged from <0.01 ppm (sugar, iodized salt) to 0.74 ppm (tea). Zn concn. ranged from <0.1 ppm (sugar, beer and other alcoholic drinks) to 95.0 ppm (brawn). Studies on Pb and Zn intake by selected population groups (farmers, city dwellers, children, students, inhabitants of Groningen) are briefly described. The toxicological significance of these results for Pb and Zn concn. in the diet is briefly discussed. AJDW

## 6

**[Effect of electrodialysis on the heavy metal content of wines.]** Über den Einfluss von Elektrodialysebehandlung auf den Schwermetallgehalt von Weinen.
Wucherpfennig, K.; Millies, K. D.
***Weinberg und Keller*** **23** (6) 241-256 (1976) [15 ref. De] [Inst. für Weinchemie und Getränkeforschung, Geisenheim, Federal Republic of Germany]

The effect of electrodialysis on wine stability by reducing the concn. of K$^+$ and associated anions was investigated. Pilot plant experiments treating 1000-2000 l. wine/h in a multiple cell showed an average reduction in total extract by 1 g/l. following removal of 100 mg K/l. and its anions. The average reduction of total acid was roughly equal to that obtained by crystallization of tartrate. Reduction of K$^+$ concn. from 800 to 700 mg/l. resulted in completely stable wines during several weeks storage at -4°C and increased alcohol concn. from 10° to 11°. The process required 0.6 W/l., i.e. 0.6 kW/h for stabilizing 1000 l. of wine. Tests on 8 wines of varying quality resulted in reductions of 70-247 mg K$^+$ and up to 1 mg Na$^+$, 16 mg Ca$^{2+}$, 30 mg Mg$^{2+}$, 0.79 mg Cu$^{2+}$ 0.02 mg Pb$^{2+}$, 0.7 mg Fe$^{2+}$, 0.67 mg Zn$^{2+}$ and 2.2 mg Mn$^{2+}$/l. The changes in composition of wine after electrodialysis were not such as to prevent quality control. RM

## 7

**Some aspects of lead pollution in Rio de Janeiro.**
Branquinho, C. L.; Robinson, V. J.
***Environmental Pollution*** **10** (4) 287-292 (1976) [19 ref. En] [COPPE, Univ. Fed. do Rio de Janeiro, Rio de Janeiro, Brazil]

Concn. of Pb in drinking water and air in Rio de Janeiro were measured. Of 70 samples of drinking water collected from various districts, mainly from older houses, 36 samples, all from houses with Pb inlet pipes, had Pb concn. of 30-1000 μg l.$^{-1}$ (mean 102 μg l.$^{-1}$), while 34 samples from houses without Pb pipes had no detectable Pb (<10 μg l.$^{-1}$). The WHO decision to raise its recommended limit for Pb in drinking water from 50 to 100 μg l.$^{-1}$ is criticized, because in tropical climates (e.g. Rio) the average daily water consumption is ≥2 × that in temperate regions. AL

## 8

**[Effect of refining on the concentration of trace metals in oils and fats.]** Der Einfluss der Raffination auf die Konzentration von Spurenmetallen in Ölen und Fetten. [Lecture]
Thomas, A.
***Fette, Seifen, Anstrichmittel*** **78** (4) 141-144 (1976) [12 ref. De, en] [F. Thörl's Vereinigte Harburger Oelfabriken, 1. Hafenstrasse 15, 2100 Hamburg 90, Federal Republic of Germany]

The published concn. of trace metals in edible oils and fats vary considerably, due both to differences in samples and methods of analysis. The detn. of As, Pb, Cd and Hg in 94 samples of crude oils (coconut, groundnut, olive, palm, rapeseed, soybean, sunflower) and fats (tallow, lard) showed that the limits of concn. proposed in German draft legislation of May 1974 were frequently exceeded for Pb and Hg. Normal refining reduced Pb concn. to <0.15 ppm (proposed limit), but the 0.025 ppm limit for Hg was exceeded in 33% of 3 coconut oil samples and 17 refined soybean oil samples. Examination of individual refining steps showed that the main reduction of Pb content took place during neutralization. RM

## 9

**[Some aspects of the chemical hygiene of milk and dairy products.]**
Renterghem, R. van
***Revue de l'Agriculture*** **29** (2) 355-378 (1976) [many ref. Fr] [Min de l'Agric., Cent. de Recherches Agron. de l'Etat-Gand, Sta. Laitiere, Brusselsesteenweg 370, 9230 Melle, Belgium]

The health hazards due to contamination of dairy products with organochlorine pesticides, polychlorinated biphenyls and heavy metals are reviewed in the light of international tolerances (especially FAO/WHO) as well as some published data on Pb and Hg levels in milk, butter and cheese. On the whole, dairy products contribute only a small proportion of the average daily intake of heavy metals. RM

## 10

**[Extraction of Pb from glazes commonly used for kitchen earthenware.]**
Beckman, I.; Guthenberg, H.; Forslund, F.; Sjögren, E.
***Var Foeda*** **26** (9/10) 236-241 (1974) [10 ref. Sv, en] [Statens Livsmedelsverk, S-10401 Stockholm, Sweden]

Data are given for leaching of Pb (determined by the official Swedish procedure) from earthenware bowls made with white slip and glazes pigmented with CoO, CuO, FeCO$_3$ or MnO$_2$. The results show that bowls pigmented with CuO considerably exceeded permissible Pb release levels; bowls pigmented with CuO or $MnO_2$ moderately exceeded permissible Pb-release levels. It is suggested that all kitchen utensils should be labelled with their Pb-release characteristics. AJDW

## 11

**Mineral composition of liver and kidney of rats fed corn, sorghum, and soybean grain grown with sewage sludges and NPK fertilizers.**

Miller, J.; Boswell, F. C.

***Journal of Agricultural and Food Chemistry*** **24** (5) 935-938 (1976) [9 ref. En] [Dep. of Food Sci., Univ. of Georgia Agric. Exp. Sta., Georgia Sta., Experiment, Georgia 30212, USA]

Corn, sorghum and soybeans were grown to maturity on soils which had been treated with NPK fertilizers or with low or high levels of sewage sludge known to be high in heavy metals. Grains from the mature plants were analysed for N (Kjeldahl method), tanning, P, K, Mg, Mn, Fe, Zn, Cu, Cr, Cd, Ni and Pb. Results are detailed in tables. Weanling rats were fed the grains and a study made of the heavy metal concn. in tissues (liver and kidney). Differences in tissue composition associated with type of soil treatment were found only for Mn, Cu and Fe and even for these elements, levels in tissues were within normal ranges. Measurable quantities of Cd, Ni and Pb were not found in grains or tissues; Cr was found in trace amounts in grains but not in tissues. JA

## 12

**[Pollution of well water with heavy metals in the Tokyo metropolitan area.]**

Takahashi, Y.; Ohashi, N.; Kowase, T.; Yamazaki, K.; Mimura, S.

***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **26** (1) 323-328 (1975) [2 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo 160, Japan]

Surveys have been made of the extent of pollution by harmful heavy metals (e.g. Cu, Cd, Cr, Zn, Ni, Pb) in the water in wells situated near factories in the Tokyo metropolitan area. Highest pollution was found in the Shimura, Akabane and Tamagawa districts. Source of the heavy metals is generally considered to be effluent discharged from metal-plating factories. [From En summ.] JA

## 13

**Contamination of tap water by lead pipe and solder.**

Wong, C. S.; Berrang, P.

***Bulletin of Environmental Contamination and Toxicology*** **15** (5) 530-534 (1976) [4 ref. En] [Ocean Chem. Div. Ocean & Aquatic Sci., Pacific Region Dep. of the Environment, 211 Harbour Road, Victoria, British Columbia V9A 3S2, Canada]

Water samples were collected from dwellings in Victoria (British Columbia, Canada) and analysed for Pb content by flameless AAS at 283.3 nm. Pb concn. varied with amount of water drawn before sampling. In 55 houses supplied by leaden service pipes, tap water samples were taken 3×/day; of these samples, 1% yielded Pb concn. (parts/billion) of >100, 5% yielded >50, 74% yielded between 25 and 50, and 16% yielded <25. However average daily values of only 2 houses exceeded 50 parts/billion, while similar values from houses supplied by Cu piping were all <25 parts/billion. Pb concn. in water drawn from a Cu-piped tap not used for 6 months was 3000 parts/billion after 25 ml flushing, and water standing for 1 h in a newly soldered experimental system produced Pb concn. >50 parts/billion for the first 12 000 l. of water drawn when Sn/Pb solders of 50/50 and 60/40 composition were used. JRR

## 14

**[Determination of Pb content in wine.]**

Kozub, G. I.; Balanutse, A. P.; Plachinte, N. V.; Babich, V. V.

***Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii*** **31** (6) 21-24 (1976) [Ru] [Tekhnologo-konstruktorskii Inst. NPO "Yanoveny", USSR]

The photoelectric colorimetric method for Pb detn. in wine is based on formation of the coloured sulpharsanPb compound; its advantage over the dithizone method is that the colour reaction with sulpharsan takes place in aqueous solution and the colour stability is higher. The technique, using a calibration curve, is described. This method was used to determine Pb in various types of wine; the Pb content fluctuated within 0.00-0.19 mg/l. The error was 9%. Detn. of Pb by paper chromatography is also described; more accurate results can be obtained by eluting Pb from the chromatogram, followed by photocolorimetric detn. STI

## 15

**[Lead in mushrooms.]** Blei in Pilzen.

Seeger, R.; Meyer, E.; Schönhut, S.

***Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung*** **162** (1) 7-10 (1976) [10 ref. De, en] [Inst. für Pharmakologie & Toxikologie, Univ., Versbacher Landstr. 9, D-8700 Würzburg, Federal Republic of Germany]

The Pb content of 222 spp. of wild mushrooms, either edible or poisonous, was determined by graphite furnace AAS. A total of 494 samples, grown in rural regions of southern Germany, was tested. The Pb content ranged from <2.0 to 40.4 (average 10.6) mg/kg dry wt. AS

## 16

**[Effects of added Pb in broiler and laying hen feed on performance and on residue levels in the tissues and eggs. I. Effects of Pb on performance.]** Der Einfluss von Bleizusätzen zum Broiler- und Legehennenfutter auf die Leistung der Tiere und auf Rückstandsgehalte in den Geweben und den Eiern. I. Einfluss von Blei auf die Leistungen der Tiere.

Vogt, H.; Nezel, K.

***Archiv fuer Gefluegelkunde*** **40** (4) 124-130 (1976) [17 ref. De, en, fr, ru] [Inst. für Kleintierzucht, Forschungsanstalt für Landwirtschaft, Celle, Federal Republic of Germany]

Effects of diets containing Pb on laying performance and egg quality were studied in a 329-day feeding trial with diets containing 2 or 5 ppm Pb (as lead oxide or lead acetate) and in a 196-day feeding trial with diets containing 20-80 ppm Pb as lead acetate. Tables of results are given, including data for shell deformation, breaking strength and yolk index. When both cracked and non-cracked eggs were taken into consideration, no significant effects of Pb on egg quality were observed. If only non-cracked eggs were considered, Pb concn. significantly influenced shell deformation value (added Pb increasing the deformation value in one trial, and decreasing it in the other). AJDW

## 17

**[Study of trace elements in marine fish. II. Distribution of heavy metals in bonito tissue.]**

Katsuki, Y.; Yasuda, K.; Ueda, K.; Kimura, Y.

***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** **26** (1) 196-199 (1975) [11 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo 160, Japan]

8 freshly caught bonitos, 59-65 cm long, obtained from Japanese coastal waters, were studied for the distribution of heavy metals in their organs and muscles. Mn, Pb, Co, Cd, Cu, Cr, Zn and total and methyl Hg were determined by AAS and GLC. Results are tabulated [in English]. Heavy metal concn. were constant and not affected by body size, season of catch or fishing area. Total Hg tended to accumulate in muscles rather than in organs; about 90% was present as methyl Hg. [From En summ.] [See FSTA (1976) 8 9R556 for part I.] JA

## 18

**[Contents of metals in fish from Finnish waters and in commercial canned fish products.]**

Karppanen, E.; Stabel-Taucher, R.

***Suomen Elaeinlaeaekaerilehti*** **82** (6) 277-284 (1976) [9 ref. Fi, sv] [Valtion Elainlaaketieteellinen Laitos, Helsinki, Finland]

The Pb, Cd, Cu and Zn contents of 245 samples of fresh fish from waters off the coast of Finland and of 53 samples of canned fish products improved into Finland were determined by AAS. Results are tabulated. Ranges found for the fresh fish and fish products, respectively, were: (mg/kg) Pb, 0.13-0.243 and 0.030-3.0; Cd, 0.0009-0.1608 and 0.0030-0.1433; Cu, 0.07-2.26 and 0.10-17.00; and Zn, 2.1-46.2 and 3.9-10.0. The Sn contents of the canned fish ranged from 4 to 180 mg/kg. The type of fish and the time and place of the catch had a considerable effect on the results. HBr

## 19

**[Results of food control in Switzerland in 1975.]** Die Durchführung der Lebensmittelkontrolle in der Schweiz im Jahre 1975.

**Switzerland**, Eidgenössisches Gesundheitsamt, Abteilung Lebensmittelkontrolle

***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** **67** (3) 271-366 (1976) [De, Fr]

Results of control of a very wide range of foods and food constituents carried out by the Swiss public health authorities during 1975 is presented in a series of detailed tables showing data from the analysis of approx. 190 000 samples of 63 foods, groups of foods, additives or adjuvants. Microbiological aspects and presence of heavy metals and pesticide residues are given particular emphasis. [See FSTA (1976) **8** 7A367 for 1974 report.] HBr

## 20

**Simple apparatus for trace analysis of toxic heavy metals. Determination of cadmium and lead by manual D. C. polarography.**

Hsieh, S. A. K.; Wong, G. J. K.; Ma, T. S.

***Mikrochimica Acta*** **II** (3/4) 253-263 (1976) [24 ref. En, de] [Dep. of Chem., Univ. of Singapore, Singapore 10]

A simple manual d.c. polarographic apparatus is described which can be assembled from ordinary laboratory equipment. The method of analysis is based on classical polarography. The sensitivity of this apparatus can reach ±0.5 mV and ±0.005 µA. Trace amounts of Cd and Pb in foods and beverages can be determined in the ppm region: min. quantity of Cd determined is 0.17 ppm, that of Pb is 0.3 ppm. RM

## 21

**[Effects of addition of Pb to the diet of broilers and laying hens on performance and on residue concentrations in the tissues and eggs. II. Effects of various levels of addition of Pb to the diet on residues in tissues and eggs.]** Der Einfluss von Bleizusätzen zum Broiler- und Legehennenfutter auf die Leistung der Tiere und auf Rückstandsgehalte in den Geweben und den Eiern. II. Einfluss verschiedener Bleizusätze zum Futter

auf die Rückstände in den Geweben und den Eiern.
Nezel, K.; Vogt, H.
***Archiv fuer Gefluegelkunde*** **40** (5) 188-192 (1976) [6 ref. De, en, fr, ru] [Inst. für Kleintierzucht, Forschungsanstalt für Landwirtschaft, Celle, Federal Republic of Germany]

Effects of diets containing 0-80 ppm added Pb (as lead acetate or lead oxide) on the Pb content of various tissues of broilers and on the Pb content of various tissues and the eggs of laying hens were studied. Broilers received the experimental diets for a 7-wk period; laying hens received the experimental diets for a 47-wk period (starting at 23 wk of age) or for a 26-wk period (starting at 43 wk of age). Tables and graphs of results are given for Pb concn. in eggs and various tissues. In general, addition of Pb to the diet had no significant effect on Pb concn. in eggs or in muscle tissue. The Pb content of kidney, liver and bone increased with increasing Pb concn. in the diet; of the tissues studied, bone accumulated the highest Pb concn. To evaluate the possibility of extraction of Pb from bone during cooking of chicken, samples of pulverized bone were boiled in water; no Pb was extracted. [See FSTA (1977) 9 2Q19 for part I.] AJDW

## 22

**Determination of lead in confection wrappers by atomic absorption spectrometry.**
Watkins, D.; Corbyons, T.; Bradshaw, J.; Winefordner, J.
***Analytica Chimica Acta*** **85** (2) 403-406 (1976) [2 ref. En] [Dep. of Chem., Univ. of Florida, Gainesville, Florida 32611, USA]

A method is reported for Pb detn. in food wrappers, involving wet digestion in conc. nitric acid, dilution and direct aspiration for analysis by AAS. This was more reliable than a dry ashing procedure, which resulted in appreciable Pb losses. Figures are given for some representative samples; in some wrappers Pb concn. was >30 000 ppm, and in some it was negligible. The presence of Pb was frequently associated with yellow (30 700 ppm) or orange (39 100 ppm) pigments although this was not invariable. JRR

## 23

**[Lead and cadmium contents of baby foods and their toxicological significance.]** Über die Blei- und Cadmiumgehalte von Kleinkindernahrung und ihre lebensmittelhygienisch-toxikologische Bedeutung.
Woggon, H.; Jehle, D.
***Nahrung*** **20** (8/9) 807-815 (1976) [11 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

A total of >150 samples of 'Fur's Kind' brand baby foods (manufactured in the German Democratic Republic) were analysed for Pb and Cd. The results show that all samples except spinach contained <100 µg Pb/kg. All samples contained <10 µg Cd/kg, except for liver-containing products which contained 25-50 µg Cd/kg. Dried milk products contained no Cd. The average daily intake of Cd and Pb by infants fed these foods is calculated; the intake of Cd and Pb/kg body wt. is at least equal to that of adults. IN

## 24

**[Direct lead determination in imported fruit juices by a colorimetric method.]**
Zawadzka, T.
***Roczniki Panstwowego Zakladu Higieny*** **27** (4) 411-418 (1976) [4 ref. Pl, ru, en] [Panstwowy Zaklad Higieny, Warsaw, Poland]

A method for detn. of Pb levels in fruit juices (lemon, oranges and grapefruit) was developed, based on direct extraction of the metal with a chloroform extract of dithizone, omitting the process of mineralization. The sensitivity of the method, expressed as $\Delta A/\Delta^{C}$ (calculated from the standard curve in the concn. range 1-8 µg Pb/10 ml $CHCl_3$ solution) was 0.027. Recovery of Pb added to samples of the juices (0.2, 0.4 and 0.8 mg $Pb/dm^3$) ranged from 82 to 100%. Comparison of the method with the standard Polish method [Polish Standard **PN-59 A-04011**] gave similar results. AS

## 25

**[The lead content of red Tuscan wines, and methods for its analysis.]**
Ramusino. F. C.; Stacchini, A.; Giordano, R.; Ravagnan, P.; Tandoi, P.; Femmine, P. delle
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** **5** (9) 307-313 (1976) [17 ref. It, en] [Lab. di Chimica, Istituto Superiore di Sanita, Rome, Italy]

A brief account is given of comparative studies on methods for detn. of Pb in wines. 5 methods were studied: (i) electric arc emission spectrometry; (ii) flameless AAS; (iii) flame AAS (without ashing or other pretreatment), (iv) flame AAS of the ashed sample; and (v) flame AAS after destruction of interfering organic substances by heating with $HNO_3$. A table of results is given. Results determined by (i), (iv) and (v) agreed well; results determined by (ii) and (iii) were lower. A total of 221 samples of red Tuscan wines (produced over the period 1961-1974 and stored in glass, wooden or cement containers) were analysed for Pb; a table and a histogram of results are given. 96% of samples had Pb contents up to the legal limit; the max. Pb concn. recorded was 2.43 mg/l. AJDW

## 26

**[Lead, cadmium and zinc in fruit and vegetables.]**
Fuchs, G.; Haeggelund, J.; Jorhem, L.
***Var Foeda*** **28** (6/7) 160-167 (1976) [9 ref. Sv, en] [Statens Livsmedelsverk, 751 26 Uppsala, Sweden]

Pb, Cd and Zn were determined by AAS in a total of 265 samples of Swedish-grown and 190 samples of imported fruit and vegetables. Detailed tables of mean values and ranges for Pb, Cd and Zn concn. are given together with Zn:Cd ratios. Max. values recorded were (mg/kg): Pb 0.288 (in apples); Cd 0.160 (in carrots); and Zn 17.84 (in spinach). The contribution of fruit and vegetables to the daily intakes of these heavy metals is discussed. AJDW

## 27

**[Quality control and determination of metal contamination in Chilean canned tomatoes.]**
Zuccarelli, M. T.; Vinagre, L. J.; Pennacchiotti, M. I.; Alonso, S. M.; Offermanns, C. J.
***Revista de Agroquimica y Tecnologia de Alimentos*** **16** (1) 50-56 (1976) [9 ref. Es] [Dep. de Ciencia de los Aliment. y Tecnologia Quimica, Fac. de Ciencias Quimicas, Santiago Norte, Univ. de Chile, Chile]

Canned tomatoes from 3 factories were evaluated for quality by USDA and National Canners' Association standards for grades, and for metal contamination. Results are tabulated for 30 samples from each factory. The following ranges were found (ppm with mean value for each factory in parentheses): Sn, 28.62-287.69 (140.47, 74.66, 97.77, max. tolerance 100 ppm); Pb, 0.34-2.34 (0.95, 0.75, 0.90, max. tolerance 2 ppm); Cu, 0.45-2.73 (0.72, 1.61, 0.97 max. tolerance 50 ppm); Zn, 0.70-12.27 (7.08, 6.02, 5.04, max. tolerance 50 ppm); and pH 3.90-4.47 (4.20, 4.18, 4.15). No correlation was found between pH and Sn concn., suggesting that the contamination was not attributable to the acidity of the product. To reduce contamination, use of electrolytic tin plate of 11.2 g/m$^2$ (normal and unvarnished) for both body and lid of cans, or differential tin plate 11.2/5.6 g/m$^2$ (normal and unvarnished) for the body and the same or varnished 5.6 g/m$^2$ plate for the lid is recommended. RM

## 28

**[Low-temperature luminescence method for quantitative determination of lead in biological samples (including barley).]**
Aleksandruk, V. M.; Arkhipov, A. F.; Mordberg, E. L.
***Gigiena i Sanitariya*** No. 10, 61-63 (1976) [6 ref. Ru] [Nauchno-issled. Inst. Gigieny Morskogo Transporta Min. Zdravookhraneniya SSR, Leningrad, USSR]

## 29

**Lead and cadmium in California raw milk.**
Bruhn, J. C.; Franke, A. A.
***Journal of Dairy Science*** 59 (10) 1711-1717 (1976) [18 ref. En] [Cooperative Extension & Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

An AAS procedure for the simultaneous measurement of Pb and Cd in raw whole milk has been developed and tested. A 100 g sample is dry ashed at a temp. 425°C. The ash in dissolved in HCl and neutralized with $NH_4OH$ to pH 8.5 in the presence of ammonium citrate. KCN is added (to complex interfering ions) followed by addition of ammonium pyrrolidino-carbodithioate to complex Pb and Cd. The complexes are extracted with isoamyl acetate and the Pb and Cd measured by AAS. Mean recoveries of Pb and Cd added to raw whole milk were 92.1 ± 2.9% and 97.5 ± 2.5%, respectively. A statewide survey showed that the mean concn. of Pb in 350 raw milk samples was 91 µg/kg; 222 of the samples contained <100 µg/kg. The mean concn. of Cd in 315 raw milk samples was 6.0 µg/kg; 40 samples contained 1.0 µg/kg, and 255 samples <10.0 µg/kg. AS

## 30

**[Determination of heavy metals in foods.]**
Tsutsumi, C.
***Journal of Japan Oil Chemists' Society [Yukagaku]*** **25** (10) 629-637 (1976) [88 ref. Ja] [Nat. Food Res. Inst., Min. of Agric. & Forestry, 1-4-12 Shiohama, Koto-ku, Tokyo, Japan]

## 31

**[Determination of Cu, Zn, Pb, Cd, Ni and Cr in vegetables, fertilizers, soils and water by X-ray fluorescence analysis.]** Untersuchungen über die Bestimmung von Kupfer, Zink, Blei, Cadmium, Nickel und Chrom in Pflanzen, Böden, Düngemitteln und Wasser mit Hilfe der Roentgenfluoreszenzanalyse. [Lecture]
Rethfeld, H.; Grössmann, G.; Egels, W.
***Landwirtschaftliche Forschung*** Sonderheft 32/I, 251-265 (1976) [4 ref. De, en, fr] [Landwirtschaftliche Untersuchungs- & Forschungsanstalt, von Esmarchstrasse 12, D-4400 Münster, Federal Republic of Germany]

The analysis of heavy metal traces in agricultural materials is described. Plant material is dried, crushed and pelletized. This simple sample preparation allows very fast and accurate analysis. To investigate matrix effects, 32 different matrices (including cereal grains, fruits and vegetables) were analysed. Slope and background for the different calibrations were determined. Result of these investigations is an amalgamation of matrices of the same kind into matrix groups. [See FSTA (1977) 9 5G327.] AS

## 32

**[Some factors affecting the content of microelements in plants in the vicinity of a zinc factory.]**
Turski, R.; Baran, S.
***Zeszyty Problemowe Postepow Nauk Rolniczych***

No. 179, 575-582 (1976) [22 ref. Pl] [Inst. Gleboznawstwa, Chem. Rolnej AR, Lublin, Poland]

The contents of various microelements (ppm in DM) were determined by emission spectrography in various plants up to 3000 m from the emitter. Means found in cereals (wheat, oats, barley) and potatoes, respectively, were: Pb, 2.0-38 and 2.7; Zn, 71.5-110.6 and 104.0; Cu, 6.6-8.5 and 4.0; Mn, 13.1-35.5 and 15.0; B, 0.5-1.2 and 4.8; and Sr, 2.0-3.5 and 7.2. Factors which could influence these concn. are discussed, including liming, growth stage and soil type. HBr

## 33

**[Pb in poultry feed.]** Blei im Geflügelfutter.
Vogt, H.; Nezel, K.
***Umschau in Wissenschaft und Technik*** 77 (2) 54 (1977) [2 ref. De] [Inst. für Kleintierzucht, Forschungsanstalt für Landwirtschaft, Celle, Federal Republic of Germany]

A brief account is given of a series of feeding trials, in which broilers received diets containing ≤10 ppm Pb (as lead acetate or lead oxide) for 7 wk, and laying hens received diets containing ≤80 ppm Pb (as lead acetate) for 198 days or ≤5 ppm Pb (as lead acetate or oxide) for 329 days. The results show no significant effect of dietary Pb on the Pb content of the breast muscle, thigh muscle or eggs; increased Pb concn. in the diet did, however, significantly increase Pb concn. in the liver, kidney and bones. AJDW

## 34

**Semi-automated determination of lead by hydride generation and atomic-absorption spectrophotometry.**
Vijan, P. N.; Wood, G. R.
***Analyst*** **101** (1209) 966-973 (1976) [11 ref. En] [Air Quality Lab., Min. of Environment, 880 Bay Street, Toronto, Ontario, Canada]

A simple, precise and accurate method for detn. of Pb in air, water and most vegetation samples has been developed for the first time using a combination of hybride generation and AAS. Sample solutions containing 0.7% v/v nitric acid (for water analysis) or 1.0% v/v perchloric acid are made to react with 12% v/v $H_2O_2$ solution followed by 4% m/v sodium borohydride solution by means of a peristaltic proportioning pump. The gaseous hydrides generated are swept by a $N_2$ stream into a heated silica tube and Pb absorbance at 217 nm is recorded. The effects of interferences and their elimination are discussed. Mean recovery of added Pb (1-5 µg) to tap water was 101.7%. Results of detn. of Pb in samples of tap water and water boiled 0-8 times in a kettle using the present method or the carbon rod atomisation method showed good agreement; the present method was more precise. Detn. of Pb in water can be made fully automatic by providing a separate line for nitric acid in the manifold. With suitable modifications the method could be adapted for detn. of Pb in foods and other biological samples, and for measuring the rate of Pb release from glazed ceramic materials. AL

## 35

**[Trace amounts of heavy metals in poultry and eggs.]** [Review]
Szabo, A.
***0128af*** **22** (10) 444-449 (1975) [15 ref. Hu] [Megyei Elelmiszerell. es Vegyvizsg. Intezet, Györ, Hungary]

## 36

**[Contamination of foods with toxic elements.]** [Lecture]
Cotta-Ramusino, F.
***Bollettino dei Laboratori Chimici Provinciali*** **26** (1) 37-41 (1975) [5 ref. It, fr, en, de] [Istituto Superiore di Sanita, Rome, Italy]

Sources of contamination, max. acceptable levels in foods and methods used by the Istituo Superiore di Sanita for determining Pb, Hg and Cd in foods are briefly discussed. Tabulated data give the mean, min. and max. levels of Hg found in 14 different foods; the highest level found was in tomato concentrate (0.022 mg/kg). [See FSTA (1977) **9** 4C140.] RM

## 37

**Lead content of roadside fruits and berries.**
Fowles, G. W. A.
***Food Chemistry*** **1** (1) 33-38 (1976) [25 ref. En] [Dep. of Chem., Univ., Whiteknights, Reading, Berks., UK]

Blackberries, elderberries, hawthorn berries, holly berries and rosehips were examined for their Pb content with respect to picking date, mean distance from road, traffic scale, and effect of washing. Tables show that Pb levels are directly related to the proximity of the growing fruits to roads, traffic density and length of exposure. Max. levels fround were (ppm Pb for undried fruit): blackberries, 0.85; elderberries, 6.70; hawthorn berries, 23.8; holly berries, 3.50; and rosehips, 1.45. Very thorough washing continuous washing for 1 h in running water) removed 40-60% Pb. When elderberries were used for winemaking, >60% Pb was extracted into the wine. RM

## 38

**Effects of sewage sludge composition, application rate, and lime regime on plant availability of heavy metals.**
John, M. K.; Laerhoven, J. van
***Journal of Environmental Quality*** 5 (3) 246-251 (1976) [15 ref. En] [Environment Canada, Fontaine Building, Ottawa, Ontario, K1A OH3, Canada]

Concn. of Cd, Zn, Pb, Ni, Mn and Fe were determined in lettuce leaves (Lactuca sativa L. var. longifolia) and in tops and tubers of beet (Beta vulgaris L.) grown on limed (pH 6.4) and unlimed (pH 5.6) silt loam treated with primary digested sewage sludge or a commercial heat-dried activated sludge ('Milorganite'). Concn. of heavy metals were not simply or solely dependant on heavy metal contamination of the soil, but varied considerably with rate of sludge application, lime regime, soil pH and time of exposure. JRR

## 39

**[Recent studies of the heavy metal content of mushrooms.]** [Review]
Quinche, J.-P.
***Revue Suisse d'Agriculture*** 8 (5) 148-149 (1976)
[4 ref. Fr]

This brief review surveys recently published work on the heavy metal content of various mushroom species. Data are given on the Hg, Pb, Cd and Se contents of Agaricus spp. from the Geneva area of Switzerland, Amsterdam and Paris and on the Hg content of various species from southern Germany. Mention is also made of an outbreak of food poisoning in the Montbeliard region caused by Psalliota bispora contaminated with a triazine herbicide. JA

## 40

**The relation between the concentration of some main elements and the stages of maturation of ovaries in cod (Gadus morrhua).**
Julshamn, K.; Braekkan, O. R.
***Fiskeridirektoratets Skrifter Serie Ernaering*** 1 (1) 1-15 (1976) [12 ref. En] [Inst. of Vitamin Res., Directorate of Fisheries, Bergen, Norway]

Samples of cod roes at various stages of the reproductive cycle were collected during Jan.-March 1974, and analysed for DM, Na, K, Ca, Mg, Fe, Mn, Zn, Cu, Co, Pb, Cd, Hg and vitamin $B_{12}$. Tables and graphs of results are given, broken down by stage of the reproductive cycle. DM concn. ranged from 17.7 to 30.1%. Concn. of all the elements studied varied considerably during the reproductive cycle. Interrelation of concn. of individual elements is discussed. Co concn. calculated as a constituent of vitamin $B_{12}$ correlated closely with total Co concn. Max. recorded Pb, Cd and Hg concn. were, respectively, (μg/g roe, wet wt. basis): 0.98; 0.05; and 0.041. These values are well below the FAO/WHO max limits for heavy metals in foods. AJDW

## 41

**[Lead content of milk produced in different zones of the Parmigiano-Reggiano cheese area.]**
Biancani, M.; Losi, G.; Lerici, C. R.; Rastelli, R.
***Scienza e Tecnica Lattiero-Casearia*** 27 (4) 313-322 (1976) [21 ref. It, en] [Istituto di Microbiol. e Ind. Agrarie, Univ. di Bologna, Italy]

144 milk samples taken monthly between Dec. 1974 and Nov. 1975 from 3 zones: (i) ceramics industry zone; (ii) near a motorway; and (iii) open country were analysed for Pb content by AAS. Average content and range in the 3 zones was: (i) 43 (27-65) μg/l.; (ii) 52 (31-97); and (iii) 35 (22.5-50). Highest levels in zone B were found in Aug.-Sept. (97 and 90 μg/l.), suggesting that the main source in every case was motor traffic. ADL

## 42

**[Determination of copper, lead, cadmium and zinc contents of milk by atomic absorption spectrophotometry.]**
Tsvetkova, Ts.; Sergeeva, D.; Koen, E.
***Veterinarnomeditsinski Nauki*** 13 (7) 28-34 (1976) [22 ref. Bg, ru, en] [Vet. Inst. po Zarazni i Parazitni Bolesti, Sofia, Bulgaria]ilia, Italy]

Samples of milk from each of 7 different areas of Bulgaria (127 samples in all) were examined during 1972-1974 using a model AA-5 Varian-Tekhtron instrument. The ranges (mg/kg) were: Cu (33 samples), 0.107-0.253; Pb (33 samples), 0.127-0.495; Cd (41 samples), 0.108-0.164; and Zn (20 samples), 3.96-5.51. SKK

## 43

**[Comparison of methods for determining lead.]**
Truffert, L.; Favart, M.; Gall, Y. le
***Annales des Falsifications et de l'Expertise Chimique*** 69 (742) 563-570 (1976) [9 ref. Fr] [Lab. Cent. de la Prefecture de Police, Paris, France]

A comparison was made of the Pb levels determined in model solutions by the following methods: common colorimetric method using dithizone and $H_2SO_4$; simplified colorimetric method using dithizone and $HNO_3$; square-wave polarography using $H_2SO_4$ or $HNO_3$; and impulse polarography using $H_2SO_4$ or $HNO_3$. Levels found by the various methods are tabulated. Results were subjected to statistical analysis. Results obtained by the simplified colorimetric method were also compared to results obtained by AAS. JA

## 44

**[Changes in the content of Zn and Pb as a result of contamination of the air in the vicinity of a non-ferrous metal factory.]** [Lecture]
Karueta, S.
***Zeszyty Problemowe Postepow Nauk Rolniczych*** No. 179, 583-587 (1976) [Pl] [Inst. Podstaw Inzynierii Srodowiska PAN, Zabrze, Poland]

The Zn contents (ppm in DM) of 10 different vegetables sampled at a distance of 1200 m from a Zn factory ranged from 68 in kohlrabi to 1020 in lettuce; corresponding range for Pb contents was 4 in kohlrabi to 230 in lettuce. Changes in the extent of the contamination during the early growth stage during 1966-1970 are tabulated. HBr

## 45

**[Basic problems in production of healthy foods. IV. Heavy metal contents of vegetables. Reasons and possibilities of reducing contaminations.]**
Grundsatzfragen zur Erzeugung einer gesunden Ernährung. IV. Schwermetallgehalte in Gemüse. Ursachen und Möglichkeiten zur Reduzierung der Belastungen. [Lecture]
Schmid, G.; Rosopulo, A.; Weigelt, H.
***Landwirtschaftliche Forschung*** Sonderheft 32/I, 59-69 (1976) [9 ref. De, en, fr] [Bayerische Landesanstalt für Bodenkultur & Pflanzenbau, Menzingerstrasse 54, D-8000 Munich 18, Federal Republic of Germany]

The heavy metal contamination of produce from market gardens in the vicinity of airfields and roads was investigated during 3 seasons. Mn, Cu, Zn, Pb, Cd and Cr concn. were determined in root, leaf, fruit and bulb (onion-type) vegetables at distances of 10-100 m from roads, in relation to the frequency of flights and after cleaning and cooking. Tabulated results showed that leaf vegetables were the main group affected. Air traffic increased the toxic metal content above the normal concn. A mean increase of 11.5% Pb was observed between 100 and 10 m distance from roads, while Cd, Zn, Mn and Cu concn. were not affected. Normal preparation reduced the mean Pb concn. by 52-65% depending on the type of vegetable, Cr by 81-93%, Cd by 7-21%, Cu by 22-44%, Mn by 32-44% and Zn by 8-25%. [See FSTA (1976) 8 12C591 for part III; and FSTA (1977) 9 5G327.] RM

## 46

**[Determination of copper, lead and tin contents in canned milk products.]**
Davydova, I. R.; Stepanova, N. S.
***Trudy, Vsesoyuznyi Nauchno-Issledovatel'skii Institut Molochnoi Promyshlennosti*** No. 42, 34-42 (1976) [10 ref. Ru] [VNIIMP, Moscow, USSR]

Cu, Pb and Sn were determined in samples of sweetened condensed milk by the chemical methods prescribed by Soviet Standard GOST 5370-58; Cu, Pb and Sn were also determined colorimetrically, Cu and Pb with sodium diethyldithiocarbamate, and Sn by formation of yellow colour with quercetin in the presence of thiourea. The colorimetric procedures are described in detail. The sensitivity of the GOST methods proved insuffucient for detn. of Cu and Pb in the product; but the GOST iodometric method for Sn was found suitable. The colorimetric methods tested are considered suitable for Cu, Pb and Sn. Dry ashing of samples at 500-550°C is recommended. SKK

## 47

**Atomic absorption spectrometric determination of some trace metals in fish meal and bovine liver by the solid sampling technique.**
Langmyhr, F. J.; Aamodt, J.
***Analytica Chimica Acta*** 87 (2) 483-486 (1976) [8 ref. En] [Dep. of Chem., Univ. of Oslo, Oslo 3, Norway]

Industrial fish meals (mackerel, blue whiting and capelin) and bovine liver were analysed by AAS, using solid sampling or atomization of liquid samples in the flame. Agreement between the two methods was satisfactory. Metal concn. ranges (ppm) in the fish meals were: Cd 0.13-0.40; Cu 3.4-5.0; Pb 0.60-1.5 and Mn 1.9-8.5. JRR

## 48

**[Heavy metals in food.]** Schwermetalle in Lebensmitteln. [Review]
Hertel, W.; Markard, C.
***Gordian*** 77 (1) 8-10 (1977) [30 ref. De]

This review considers the toxic effects of Cd, Hg and Pb, their concn. in a range of animal and vegetable foods, possibilities of decontamination, and relevant Federal German regulations and recommendations. RM

## 49

**Food surveillance in the UK.**
Hubbard, A. W.

***BNF Bulletin*** No. 19, 45-54 (1977) [10 ref. En] [Min. of Agric., Fisheries & Food, Great Westminster House, Horseferry Road, London SW1P 2AE, UK]

Surveillance of food for Pb and Cd contaminants is discussed. Figures are given for their contents in food groups in total diets, for Pb in brassicas and root crops grown near a metal refining plant, and for Pb pick-up by some fruits, vegetables and baked beans packed for 3 months in glass jars (Pb range 0.02-0.08 mg/kg), plain cans (0.11-0.50 mg/kg), and lacquered cans (0.15-1.05 mg/kg). AL

## 50

**Distribution of lead and other metals in tea leaves, dust and liquors.**
Michie, N. D.; Dixon, E. J.
***Journal of the Science of Food and Agriculture*** 28 (2) 215-224 (1977) [5 ref. En] [Dep. of Ind., Lab. of the Gov. Chem., Cornwall House, Stamford Street, London SE1 9NQ, UK]

When samples of certain teas were analysed for Pb, repeat detn. made on the same samples showed a wide variation in the results. This was found to be due to dust particles, with a high Pb content, which were dispersed throughout the tea leaves. Further work showed that there was also more Fe, Zn and Cu in the dust than in the leaves. Analyses of tea prepared as for drinking showed that only a small amount of the Pb, Cd, Ni, Fe, Zn and Cu present in the leaves passed into the brew. The proportion of each metal extracted into the brew appeared to be independent both of the strength of brew and of the type of water used. Work with tannic acid solution indicated that soluble polyphenols could be responsible for complexing metals. AS

## 51

**[Method for determining the lead content of fruit, berries and preserves packaged in glass and tinplate containers.]**
Manuilova, T. A.; Spektor, L. A. **Union of Soviet Socialist Republics,** Moldavskii Nauchno-issledovatel'skii Institut Pishchevoi Promyshlennosti
***USSR Patent*** 544 915 (1977) [Ru]

Analysis with improved sensitivity and accuracy is performed by ashing the sample, dissolving the ash, introducing a background electrolyte containing a mixture of orthophosphoric and perchloric acids, preferably at 1-2 M and 0.5-0.6 M respectively, and determining the Pb content in an a.c. polarograph. W&Co

## 52

**[Determination of total lead in clarifying agents based on lead acetate.]**
Rens, G.
***Sucrerie Belge*** 96 (1) 3-7 (1977) [4 ref. Fr, de, en, nl] [Raffinerie Tirlemontoise, Tirlemont, Belgium]

A standardized volumetric method is described using 0.05M EDTA, which permits detn. of total Pb in solid and liquid clarifying agents based on neutral of basic lead acetate. The method is simple, quick and accurate and within the scope of any laboratory. [See also FSTA (1974) 6 5L303.] AS

## 53

**[Investigations into the lead and cadmium contents of meat and organ samples from poultry.]**
Untersuchungen auf den Gehalt an Blei und Cadmium in Fleisch- und Organproben von Geflügel.
Holm, J.
***Fleischwirtschaft*** 56 (11) 1649-1650 (1976) [4 ref. De, en, fr] [Staatliches Veterinäruntersuchungsamt, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

The meat and in most cases the liver and kidney of 61 young fowls, 78 broilers and 53 boiling fowls were analysed for Pb and Cd by $HNO_3/HClO_4$ wet digestion and AAS. Tabulated results showed mean concn. (ppm) of: 0.007-0.009 Pb and 0.002 Cd in meat; 0.076-0.127 Pb and 0.063-0.701 Cd in kidney; and 0.032-0.100 Pb and 0.038-0.497 Cd in liver. Max. individual results were 1.183 and 1.307 ppm Pb and 1.911 and 4.545 ppm Cd, in kidneys of broilers and boiling fowls. RM

## 54

**[Pb and Cd in meat and organs from slaughter cattle.]** Untersuchungen über den Blei-(Pb) und Cadmium-(Cd) Gehalt in Fleisch und Organen von Schlachtrindern. [Lecture]
Kracke, W.; Kreuzer, W.; Sansoni, B.; Wissmath, P.
***Proceedings of the European Meeting of Meat Research Workers*** No. 22, F1:1-F1:10 (1976) [39 ref. De, en, fr, ru] [Gesellschaft für Strahlen- und Umweltforschung mbH, D-8042 Neuherberg bei München, Federal Republic of Germany]

Samples of adductor muscle, liver and kidney from a total of 278 cattle of various breeds (0.8-15 yr of age) were collected in 1972-1975, and analysed by AAS for Cd and Pb. Mean values and ranges of values for Cd concn. were (ppm): muscle $<0.005$, no range given; liver 0.066 and $<0.005$-1.65; and kidney 0.311 and 0.008-1.95. Corresponding values for Pb were: muscle $<0.05$, no range given; liver 0.15 and 0.02-0.85; and kidney 0.34 and 0.10-2.00. The results were highly variable, especially for kidney tissue. Cd content of the kidneys tended to increase with increasing age of the animal. No effects of sex, breed or feeding method on the Cd of Pb concn. in the tissues studied were observed. The results are discussed in relation to literature data and proposed legal limits; interrelation of Cd and Pb concn. in the tissues studied is discussed. [See FSTA (1977) 9 6S988.] AJDW

## 55

**[Lead and cadmium contents of herbs and spices.]**
Blei- und Cadmiungehalt von Gewürzen.
Bielig, H. J.; Dreyer, H.; Askar, A.
***Deutsche Lebensmittel-Rundschau*** 73 (2) 43-44 (1977) [8 ref. De, en, fr] [Inst. für Lebensmitteltech., Tech. Univ., Berlin (West)]

Cd and Pb were determined by AAS in commercial samples of various herbs and spices. Values for Pb were (ppm): (i) basil 2.65; (ii) savory (2 samples) 1.35 and 3.17; (iii) dill (2 samples) 2.44 and 2.70; (iv) tarragon 2.12; (v) marjoram 2.63; (vi) parsley (2 samples) 1.32 and 2.24; (vii) rosemary 2.78; (viii) thyme 3.03; (ix) caraway seeds 1.13; (x) paprika 1.44; (xi) white pepper 1.10; (xii) black pepper 0.34; (xiii) curry powder (3 samples) 2.35, 3.88 and 14.93; (xiv) cayenne pepper 4.50; (xv) cinnamon 1.10; and (xvi) vanilla pods 0.98. Corresponding values for Cd were, respectively (ppm): (i) 0.189; (ii) 0.188 and 0.242; (iii) 0.314 and 1.941; (iv) 0.335; (v) 0.281; (vi) 0.149 and 0.175; (vii) 0.305; (viii) 0.193; (ix) 0.138; (x) 0.203; (xi) 0.074; (xii) 0.071; (xiii) 0.073, 0.135 and 0.216; (xiv) 0.470; (xv) 0.363; and (xvi) 0.393. Only one sample (a curry powder) exceeded tolerances for heavy metals in foods in the Federal Republic of Germany. It is concluded that herbs and spices do not contain hazardous Pb or Cd concn. AJDW

## 56

**Temperature-programmable furnace for ashing of foods in trace metal analysis.**
Holak, W.
***Journal of the Association of Official Analytical Chemists*** 60 (1) 239-240 (1977) [7 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

The use of a programmable furnace in preparing samples for determining Cd, Pb, Cu, and Zn by differential pulse anodic stripping voltammetry or AAS is convenient and time-saving. Recovery data for these 4 metals in various foods (tuna, sardines, milk) were 93-96% for 0.01-1 ppm Cd, 96-114% for 0.05-5 ppm Pb, 100-108% for 2-10 ppm Cu, and 97% for 10 ppm Zn. AS

## 57

**[Determination of lead in food products by flameless atomic absorption.]**
Gherardi, S.; Bigliardi, D.; Bellucci, G.
***Industria Conserve*** 51 (4) 273-278 (1976) [29 ref. It, de, en, fr] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

Interference by a number of mineral salts with the detn. of Pb by flameless atomic absorption (FAA) in a graphite furnace was studied with model solutions. The chemical interference and molecular absorption caused by $Na^+$, $K^+$, $Ca^{2+}$, $Mg^{2+}$, $SO_4^{2-}$, $Cl^-$, $NO_3^-$, $PO_4^{3-}$, $CO_3^{2-}$, citrate and acetate are illustrated in a series of diagrams. The interference was eliminated by chelation of the Pb with sodium diethyl dithio carbamate followed by extraction of the chelate with methyl isobutyl ketone. Details will be described in a future publication. RM

## 58

**[Metal packaging materials.]**
Madi, L. F. C.
***Boletim do Instituto de Tecnologia de Alimentos, Brazil*** No. 47, 21-52 (1976) [11 ref. Pt, en]

Aspects considered in this discussion of cans for foods and other products include: characteristics and applications of materials used for can manufacture (tin plate, Cr-plated steel, Al, non-coated steel plate); manufacture of 2- and 3-part cans; seaming methods; and corrosion of cans by foods, with consequent effects on shelf-life, and on uptake of Sn, Pb, Fe etc. by the product. AJDW

## 59

**Zinc, copper, lead and cadmium contents in green tea.**
Tsushida, T.; Takeo, T.
***Journal of the Science of Food and Agriculture*** 28 (3) 255-258 (1977) [9 ref. En] [Nat. Res. Inst. of Tea, Kanaya-cho, Haibara-gun, Shizuoka Prefecture, Japan]

The levels of Zn, Cu, Pb and Cd in green tea were determined by AAS. During growth and development of tea shoots, Zn, Cu, Pb and Cd concn. decreased gradually. Some of the Pb in green tea was eliminated by washing with water before processing. The ranges and mean levels in 139 green teas were as follows: Zn 23.4-100.5 and 54.4 μg/g; Cu 4.7-36.5 and 11.4 μg/g; Pb 0.11-1.93 and 0.49 μg/g; and Cd 0.013-0.098 and 0.036 μg/g. Significant differences in the contents of Cu and Pb were observed between different districts in Japan. The green tea produced in districts near metropolitan areas contained the highest concn. of Pb. AS

## 60

**[Losses of the trace element contents of some vegetables on cooking.]**
Gergely, A.; Lindner-Szotyori, K.
***Elelmiszervizsgalati Koezlemenyek*** 22 (4) 212-219 (1976) [26 ref. Hu, ru, de, en] [Orsz. Elelmezes es Taplalk. Int. Budapest, Hungary]

Trace element contents of peeled potatoes, spinach, savoy and cauliflower were determined in the fresh condition and after boiling in an 1:1 amount of tap water for 15 min with 2% NaCl, using a Perkin-Elmer atomic absorption instrument (type 403) for the detn. of Cu, Pb and Zn. Losses on cooking averaged 10-30% for Cu, 24-50% for Pb and 23-79% for Zn. Detailed data for the individual samples are tabulated. Relatively large amounts of Pb are introduced into the human organism by spinach, since 100 g consumed spinach introduces 47.0 μg of Pb, due to its high original Pb content and to the low losses on cooking. Potatoes and spinach proved to be valuable sources of Cu and Zn. IF

## 61

**[Determination of basic lead in clarifying agents based on lead acetate.]**
Rens, G.
***Sucrerie Belge*** 96 (2) 51-57 (1977) [6 ref. Fr, de, en, nl] [Raffinerie Tirlemontoise s.a., 3300 Tienen, Belgium]

A standardized method for detn. of basic Pb in solid or liquid clarifying agents based on neutral or basic lead acetate is described. It utilizes titration with 0.1N NaOH in the presence of a stoichiometric quantity of 0.05M EDTA solution which complexes the Pb plus a pH indicator. This method, which is simple, quick and accurate, complements the standard method for detn. of total Pb. [See FSTA (1977) 9 6L497.] AS

## 62

**[Determination of lead and cadmium in cereal and grass samples growing at varying distances from highways by flameless atomic absorption spectroscopy.]** Bestimmung von Blei und Cadmium in Getreide- und Grasproben aus verschiedenen Entfernungen von Autostrassen mit Hilfe der flammenlosen Atomabsorptions-Spectroskopie.
Horak, O.

*Landwirtschaftliche Forschung* 29 (3/4) 289-298 (1976) [23 ref. De, en, fr] [Inst. für Landwirtschaft, Forschungszentrum, Seibersdorf, Austria]

A method described for detn. of Pb and Cd in grains and grass involves wet digestion of samples with a 5:1 mixture of nitric acid and perchloric acid, and measurement of Pb and Cd in the solution by flameless AAS with a graphite furnace. Pb content of grains of rye, wheat, barley and oats ranged from 0.11 to 4.36 ppm (DM basis) and was strongly dependent on traffic density. Highest levels were found in barley (3.95 ppm) and oats (4.36 ppm). Cd contents were generally low (20-82 parts/billion, DM basis) and not affected by traffic density. Highest levels were found in wheat (82 parts/billion). AS

## 63

**Cadmium, lead and mercury contents of milk, evaporated milk, buttermilk and yoghurt in the Netherlands.**
Ellen, G.; Tibbesma, G.
*Netherlands Milk and Dairy Journal* 30 (3/4) 174-185 (1976) [15 ref. En, nl] [Food Inspection Service for District of Friesland, Leeuwarden, Netherlands]

Analytical methods are described in detail for estimating the Cd, Pb and Hg contents of dairy products. After freeze-drying the samples, a temp.-programmed procedure for dry ashing up to 500° C was used for Cd abd Pb analyses, followed by differential pulse anodic stripping voltammetry; for Hg analysis, the freeze-dried samples were digested with $HNO_3$ under pressure at 140° C in Teflon bombs, followed by cold vapour AAS detn. Analysis of 11 samples of pasteurized milk, 7 of canned evaporated milk, 15 of bottled evaporated milk, 5 of buttermilk and 5 of yoghurt (all originating from Netherlands dairy factories) showed that the Hg contents were below the detection limit of 0.5 µg/kg. Mean Cd contents were $<0.5$ µg/kg in all products except canned evaporated milk which contained 2.2 µg/kg. Mean Pb contents ranged from 4.1, 4.8 and 5.5 µg/kg in pasteurized milk, buttermilk and yoghurt respectively to 13.4 µg/kg in bottled evaporated milk and 344 µg/kg in canned evaporated milk. MEG

## 64

**[Whey-based fish meal-free fish food.]**
Fischmehlfreies Fischfutter auf Molkenbasis.
Meske, C.; Ney, K. H.; Pruss, H. D.
*Fortschritte in der Tierphysiologie und Tierernaehrung* No. 8, 56-70 (1977) [21 ref. De, en] [Bundesforschungsanstalt für Fischerei, Aussenstelle Ahrensburg der Inst. für Küsten- & Binnenfischerei, D-2070 Ahrensburg, Federal Republic of Germany]

Comparative feeding trials with silver carp (Hypophthalmichthys molitrix) and grass carp (Ctenopharyngodon idella) are described, in which whey-based diets were compared with commercial fish foods. Feeding liquid whey or dried whey alone gave poor results (no wt. gain); a soybean meal/acid whey powder/fat (4:5:1) diet supplemented with methionine, lysine and a trace element mixture gave wt. gains at least equal to those achieved with a commercial feed. Muscle tissue samples from carp fed the above soybean meal/acid whey powder/fat diet or 3 commercial diets were analysed for heavy metals, aflatoxins and organochlorine compounds. Tables of results are given. Samples from carp fed the whey-based diet contained approx. 0.1 ppm Hg and 0.07 ppm Pb, vs. 0.09-0.17 ppm Hg and 0.03-0.05 ppm Pb for those from carp fed commercial diets. No aflatoxins were detected in any sample. Muscle tissue from carp fed the commercial diets contained polychlorinated biphenyls, DDD, DDE and traces of dieldrin; samples from fish fed the whey-based diet contained polychlorinated biphenyls plus traces of hexachlorobenzene. Residue concn. in all samples were well within legal limits. Taste panel studies showed fish fed the whey-based diet to be preferred (because of their tender, lean, white meat, and absence of any musty flavour). AJDW

## 65

**[Heavy metal and organohalogen compound contents in the seal Phoca vitulina from the German North Sea coast.]** Ergebnisse über Schwermetall- und Organohalogenuntersuchungen am Seehund (Phoca vitulina) der deutschen Nordseeküste.
Huschenbeth, E.
*Informationen fuer die Fischwirtschaft* 24 (1) 18-20 (1977) [1 ref. De] [Inst. für Küsten- & Binnenfischerei, Hamburg, Federal Republic of Germany]

Data are given for a total of 63 seals collected during the period 1974-1976. Ranges of values for heavy metals in the liver were (mg/kg): Zn 27.0-56.0; Cu 2.6-17.0; total Hg 1.5-160.0; Cd 0.010-0.200; and Pb 0.10-0.57. Ranges of values for organochlorine compounds in belly fat were (mg/kg): polychlorinated 0.04-0.98; and dieldrin 0.04-0.90. The results are discussed in relation to literature data. AJDW

## 66

**[Determination of traces of heavy metals in aroma compounds.]**
Palliere, M.; Gernez, G.
*Annales des Falsifications et de l'Expertise Chimique* 69 (747) 821-832 (1976) [10 ref. Fr] [Rhone-Poulenc Ind., Cent. Nicolas-Grillet, 13 Quai Jules-Guesde, 94400 Vitry-sur-Seine, France]

Methods are described for detn. of As, Cd, Pb and Hg in flavourings. 2 methods are proposed for each element: a sensitive accurate AAS method (limits of detection 0.010 ppm for As and Cd, 0.050 ppm for Hg and Pb) and a simple screening method (limits of detection 1 ppm for As, 2 ppm for Cd, 5 ppm for Pb; no simple method for Hg). Application to vanilla, coffee, apricot, peach, onion and strawberry essence achieved $\nless 90\%$ recovery. A modified Pien apparatus for careful wet ashing, and apparatus for producing volatile hydrides prior to AAS (e.g. $AsH_3$) is described with the aid of diagrams. RM

## 67

**Determination of metals in foods. A review. [Review]**

Crosby, N. T.

***Analyst*** **102 (1213) 225-268** (1977) [346 ref. En] [Dep. of Ind., Lab. of the Gov. Chem., Cornwall House, Stamford Street, London SE1 9NQ, UK]

The whole field of metallic elements in food is reviewed from the analysts' standpoint. The general principles of analytical methods, advantages and disadvantages of alternative techniques and practical considerations important to the food analyst are discussed. Some comments on the usage, toxicity, analysis and occurrence in food of As, Cd, Pb, Hg, Se, Sn and nutrient metals are given. Results for a number of metals in total-diet samples and in fresh and canned foods are discussed, as well as control of trace metals in foods and future developments. AL

## 68

**[Determination of heavy metals in foods by inverse polarography. II. The content of lead, cadmium and copper in edible fungi.]** Die Bestimmung von Schwermetallspuren in Lebensmitteln mit Hilfe der Inverspolarographie. II. Über den Gehalt von Blei, Cadmium und Kupfer in Speisepilzen.

Collet, P.

***Deutsche Lebensmittel-Rundschau*** **73** (3) 75-82 (1977) [9 ref. De, en, fr] [Chem. Untersuchungsamt für das Saarland, Saarbrücken, Federal Republic of Germany]

Concn. of Cu, Cd and Pb were determined by inverse polarography and AAS in samples of fresh mushrooms, canned mushrooms, and numerous other species of edible fungi, collected in the Saar region of Germany or near Lake Maggiore, Italy. Mean values and ranges for Pb, Cd and Cu respectively (with number of samples in parentheses were (mg/kg): fresh cultivated mushrooms (23) 0.67 and 0.008-0.196, 0.014 and 0.003-0.035 and 2.88 and 0.83-6.56; canned cultivated mushrooms (19) 0.23 and 0.064-0.501, 0.017 and 0.003-0.050, and 3.33 and 0.46-8.20; and wild edible fungi (155) not given and 0.003-3.920, not given and 0.008-10.321, and not given and 0.09-82.50. Psaliota arvensis and Ps. abruptibula had an especially high Cd concn. Data are also given for the Cd concn. in individual parts of wild edible fungi, and concn. factors relating Cd, Pb, and Cu concn. of the fungi to those of the substrate on which they were growing. [See FSTA (1975) 7 11C432 for part I.]

## 69

**[Determination of total and basic lead in clarifying agents based on a lead salt.]**

Rens, G.

***Sucrerie Belge*** **96** (3) 87-90 (1977) [3 ref. Fr, de, en, nl] [Raffinerie Tirlemontoise, Tirlemont, Belgium]

The standard technique for detn. of total Pb with 0.05M EDTA was applied to $Pb(NO_3)_2$ clarifying agent in the solid state and in solution, as used in the standard Clerget method. The basic Pb was determined by titration with 0.1N NaOH in the presence of a quantity of EDTA stoichiometrically equivalent to the total Pb, in prepared or diluted solutions of clarifying agents based on neutral and basic lead acetate (clarified by addition of 1N $HNO_3$ instead of 1N acetic acid). The accuracy of the method was ±1.6% for total Pb, 2.8% for basic Pb and 3.3% for the basic Pb as % of total Pb (basicity). RM

## 70

**[Lead contamination in milk.]**

Maffeo, G.; Renon, P.

***Archivio Veterinario Italiano*** **27** (3/4) 84-87 (1976) [16 ref. It, en, fr] [Istituto di Fisiologia, Univ. di Milano, Milan, Italy]

This study was carried out on a total of 19 dairy farms situated in 7 industrial areas in the Milan province. Pb levels in bulk milk samples collected during Sept.-Nov. 1975 from each farm, and analysed by AAS, ranged from 0.08 to 0.23 mg/l. High levels of Pb were also found in samples of soil, forage and viscera of slaughtered animals obtained from these areas, particularly in those where contamination of milk was greatest. MC

## 71

**Trace metal and protein concentrations in California market milks.**

Bruhn, J. C.; Franke, A. A.

***Journal of Food Protection*** **40** (3) 170-173 (1977) [17 ref. En] [Cooperative Extension, Univ. of California, Davis, California 95616, USA]

225 market milk samples were collected in 3 major milk marketing areas in California. Samples represented 4 products: regular, extra-rich, skim- and low-fat milk. Concn. of Cd, Cu, Pb, Zn and protein were measured in all samples. The concn. of Se was measured in 103 of the samples. Mean concn. in all samples examined were (μg/kg): Cd, 5.0; Cu, 41.0; Pb, 60.3; and Se, 24.4. No significant differences between market or product means were found for these 4 metals. Mean product concn. for protein (%) and Zn (mg/kg) respectively were: regular milk, 3.29 and 3.61; extra-rich milk, 3.33 and 3.70; skim-milk, 3.61 and 3.98; and low-fat milk, 3.82 and 4.18. Low-fat and skim-milks had greater concn. of protein and Zn than did regular and extra-rich milks ($P < 0.05$). AS

### 72

**[Quantitative determination of lead in milk.]**
Bertolani, G.; Mazzali, P.; Barbieri, G.; Fogliani, G.; Conti, E.
***Industrie Alimentari*** 16 (3) 102-104 (1977) [30 ref. It] [Lab. Igiene e Profilassi, Modena, Italy]

Average pB content of bulk milk received at various dairies in the province of Modena, Italy, was 0.09 ppm (range, 0.03-0.14 ppm). In 57 milk samples from individual animals in an industrial area of the province (mainly ceramics industry) Pb content was much higher, 0.17-1.53 ppm. Analysis of fodder grown in the area revealed a Pb content up to about 100 ppm (in DM). All detn. (by AAS) were made between Sept. and Jan. ADL

### 73

**[Lead in the meat and internal organs of beef cattle.]** Blei in Fleisch und Organen von Schlachtrindern.
Kreuzer, W.; Sansoni, B.; Kracke, W.; Dietl, F.; Wissmath, P.
***Fleischwirtschaft*** 57 (3) 442-444, 447-452 (1977) [123 ref. De, en, fr] [Inst. für Hygiene & Tech. der Lebensmittel Tierischen Ursprungs, Veterinärstrasse 13, 8000 Munich 22, Federal Republic of Germany]

In order to determine normal Pb contents of beef for the purpose of setting tolerance limits, 146 head of varying age (0.8-15.0 yr), sex and breed from the normal kills of a mainly agricultural area were examined between 1972 and 1974. Pb in meat, liver and kidneys was determined by $H_2O_2/Fe^{2+}$ wet ashing and flameless AAS in a graphite tube. With 2 exceptions, the highest Pb contents were found in kidneys. Pb concn. were 0.10-2.75 ppm in kidneys (coeff. of variation ± 78%), 0.05-0.40 ppm in liver (coeff. of variation ±40%) and $<0.05$ ppm in meat. The large coeff. of variation were attributed to variations between individuals. No statistically significant relation was observed between Pb concn. in internal organs, and age, sex and season; the concn. in liver and kidneys of individual animals were significantly correlated. The results show that meat, liver and kidneys make only a small contribution to the total Pb in the diet. RM

### 74

**[Heavy metal contamination of indigenous game.]** Zur Schwermetallkontamination von einheimischem Wild.
Höllerer, G.; Coduro, E.
***Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung*** 163 (4) 260-263 (1977) [4 ref. De, en] [Landesuntersuchungsamt für das Gesundheitswesen Südbayern, Lothstrasse 21, D-8000 Munich 40, Federal Republic of Germany]

Mean values for heavy metal contents of livers of 71 hares, 127 roe deer, 9 red deer and 17 wild boar in Bavaria were, respectively, (ppm): Hg (Coleman Hg analyser), 0.55, 0.02, not detectable and 0.04; Pb (AAS), 1.10, 0.43, 0.55 and 0.38; and Cd (AAS), 0.25, 0.33, 0.27 and 0.60. Data classified into 9 regions of Bavaria are also tabulated. Concn. of Pb and Cd increased with age of animal in the 4 species studued, but the concn. of Hg increased only in hares; it remained constant in roe deer, was not detectable in red deer, and decreased in wild boar. SKK

### 75

**[Food legislation aspects of migration and corrosion, in relation to metal packs.]**
Lebensmittelrechtliche Aspekte von Migration und Korrosion im Hinblick auf Metallverpackungen.
Nehring, P.
***Verpackungs-Rundschau*** 27 (11) 1368, 1370, 1372, 1374, 1376; (12) 1496-1498 (1976) [35 ref. De, en, fr] [Inst. für Konserventech. Braunschweig, Federal Republic of Germany]

Interaction of foods with metal packs is discussed, together with effects of organic lacquers or coatings. Migration of Cd, Pb and Sn are discussed in detail, with reference to the danger of contamination of the food, and possible effects on nutritional value. The use of food simulants in studies on uptake of metals is discussed, and problems of studies on corrosion of metal packs are considered. Mechanisms of corrosion of Sn and Pb by various foods are discussed. Studies showed that uptake of Al or Cr by foods is negligible. It is suggested that tolerances may be set for metals in foods; these tolerances provide adequate consumer protection. IN

### 76

**[The Central Environmental Chemical Recording and Evaluation Office of the Federal Health Agency. III. The estimability of heavy metal intake (lead, cadmium, mercury) from foods.]** Die Zentrale Erfassungs- und Bewertungsstelle für Umweltchemikalien des Bundesgesundheitsamtes (ZEBS). III. Eine Betrachtung über die Abschätzbarkeit der Schwermetallzufuhr (Blei, Cadmium, Quecksilber) über Lebensmittel.
Wosing-Narr, U.; Musche, R.
***Bundesgesundheitsblatt*** 20 (4) 49-52 (1977) [11 ref. De, en] [Zentrale Erfassungs- & Bewertungsstelle für Umweltchemikalien, Bundesgesundheitsamt, Postfach, 1000 Berlin (West) 33]

The present state of knowledge on the intake of heavy metals through food as marketed is presented in the form of a preliminary statistical evaluation; figures are given for estimated weekly per capita intake of Pb, Cd and Hg from various food product groups, both in mg and as % of total intake. Total Pb intake is 3.09 mg/wk, with 28% from fruit, 20% from alcoholic drinks and 15% from vegetables; total Cd intake is 0.41 mg/wk, with 20% from alcoholic drinks; and total Hg intake is 0.18 mg/wk, with 22% from alcoholic drinks and 18% from fish and fish products. JRR

### 77

**[Collaborative trials on determination of lead in foods by atomic absorption spectrometry.]**
Ringversuch zur Bestimmung von Blei in Lebensmitteln mittels Atomabsorptionsspektrophotometrie.
Müller, U.; Hauser, E.; Kappeler, A.; Merk, E.; Steiner, K.; Windemann, H.
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** 68 (1) 126-150 (1977) [10 ref. De, fr] [Kantonales Lab., Bern, Switzerland]

Collaborative trials were carried out using, in 4 laboratories respectively, the following AAS instruments: Beckman single beam model 1301 with turbulence burner ($H_2$/air); Beckman single beam model 448 with streamline burner (acetylene/air); Perkin-Elmer double beam model 306 with 3-slit burner (acetylene/air) and $D_2$ compensator; and Zeiss single beam model FMD with universal streamline burner (acetylene/air) and $D_2$ compensator. Numerous tests were carried out on standard solutions and samples of meat, fish, and vegetables (grown customarily or in the vicinity of motorways). Procedures, results and their statistical interpretation are presented and discussed in detail. Wet-ashing with $HNO_3/H_2O_2$; the additive method of measurement with 2-wavelength background compensation or $D_2$ compensation; and for low Pb contents, the extraction method, are recommended. SKK

### 78

**[Effects of environmental pollution on animals and foods of animal origin.]**
Üsdal[Üstdal][?], K. M.
***Veteriner Hekimler Dernegi Dergisi*** 45 (3) 21-24 (1975) [8 ref. Tr] [Vet. Fac., Univ., Ankara, Turkey]

The author discusses the contamination of animal products by F, Hg, Mo Pb, dust from cement factories, S compounds, pharmaceutical products, parasites, bacteria, fungi, and radioactive substances. He refers, for example, to a Czechoslovak investigation in which 0.55-0.79 mg Pb/l. was found in milk of cows grazing near a Pb processing factory. The accident at the Windscale nuclear plant (UK) in 1957 is cited as a case where milk had to be discarded owing to radioactive contamination. ADL

### 79

**[Trace metal determination in drinking water by flame-AAS after concentration by means of activated carbon.]** Spurenmetallbestimmung im Trinkwasser mit der Flammen-AAS nach Anreicherung über Aktivkohle.
Mihm, U.; Leberl, C.
***Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IB*** 164 (3) 262-270 (1977) [5 ref. De, en] [Hygiene-Inst., Univ. Bonn, Klinikgelände 35, D-5300 Bonn-Venusberg, Federal Republic of Germany]

A procedure for detn. of low concn. of Pb, Cd, Cr and Zn in drinking water is described. 1 l. of the water under test is adjusted to pH 3.5 with 2N HCl, and mixed with 50 ml of a 1% aquecus solution of the complexing agent ammonium pyrrolidine dithiocarbamate. After approx. 1 min the mixture is filtered using a nitrocellulose membrane filter covered with 50 mg activated C powder. The filter + activated C is heated with 3 ml concn. $HNO_3$; the vol. is then made up to 10 ml. This procedure thereby gives a 100-fold concn. of the heavy metals present in the water. A 200 μl sample is then analysed by flame AAS; heavy metal concn. are determined by reference to calibration curves. Recovery is 80-100%. Accurary and reproducibility of the method comply with the requirements of the current German standards for analysis of drinking water. AJDW

### 80

**[Heavy metal accumulation in mushrooms.]**
Schwermetellanreicherungen in Pilzen.
Enke, M.; Matschiner, H.; Achtzehn, M. K.
***Nahrung*** 21 (4) 331-334 (1977) [17 ref. De, en, ru] [Hygiene-Inst. des Bezirkes Halle, German Democratic Republic]

Concn. of Cu, Pb, Cd and Zn were determined by square-wave polarography in samples of the fungi (including Hypholonia fasciculare, Polyporus frondosus, Armillaria mellea, Macrolepiota procera, and Pholiota squarrosa) collected either (i) ≤800 m or (ii) 800-5000 m from a non-ferrous metal smelting plant. Ranges of values for heavy metal concn. were for (i) samples (μg/g DM): Cu, 130-185; Pb, 51-178; Cd, 4.5-36; and Zn, 120-1170. Corresponding values for (ii) samples were: Cu, 33.1-85.5; Pb, 1.3-10.0; Cd, 2.2-2.5; and Zn, 9.5-51.4. IN

### 81

**Hormones, drugs, metals and pesticides in milk: a guide to the literature.** [Review]
Cowie, A. T.; Swinburne, J. K.
***Dairy Science Abstracts*** 39 (7) 391-402 (1977) [many ref. En] [Nat. Inst. of Res. in Dairying, Shinfield, Reading RG2 9AT, UK]

Mechanisms of excretion are reviewed generally and the transfer of specific substances into milk are considered, covering particularly human and cows' milk. JMD

### 82

**Lead and freshwater fishes. I. Lead accumulation and water pH.**
Merlini, M.; Pozzi, G.
***Environmental Pollution*** 12 (3) 167-172 (1977) [16 ref. En] [J. D. Res., Sci. & Education CEC, Euratom JRC, 21020 Ispra, Italy]

Effects of water pH (6.0 or 7.6) on uptake of Pb by sunfish (Lepomis gibbosus) collected from Lake Maggiose, Italy were studied. The fish were held in aquaria in water containing 40 parts/billion $Pb(NO_3)_2$ labelled with $^{203}Pb$. Pb concn. factors were determined after 2, 4, 6 and 8 days in the Pb-containing water. Pb was determined in various body components of fish held in the Pb-containing water for 8 days. Tables of results are given. Concn. factors were 2.5-3.0 times greater at pH 6.0 than at pH 7.5. At both pH values, the Pb concn. factor for muscle was much lower than that for other tissues. AJDW

### 83

**[Uptake and accumulation of lead in sheep fed contaminated hay from the vicinity of motorways.]**
Aufnahme und Akkumulation von Blei beim Schaf nach Fütterung mit kontaminiertem Autobahnheu.
Zuber, R.; Bovay, E.; König, H.; Rossi, G. L.; Luginbühl, H.
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** 68 (1) 112-125 (1977) [3 ref. De, fr, it, en] [Eidgenössische Forschungsanstalt für Agrikulturchemie & Umwelthygiene, Liebefeld-Bern, Switzerland]

In continuation of earlier work [Zuber et al., Schweizerische Landwirtschaftliche Forschung (1972) 11, 45], (i) a group of 4 sheep received for 54 wk a ration of pelletted grass meal from grass growing in the vicinity of a motorway, while (ii) a group of 2 sheep received ordinary pelletted grass meal. Total Pb intakes of (i) and (ii) were 78.14 and 6.89 g/sheep. Tabulated Pb contents of body parts and organs include for (i) and (ii) respectively (pp. in DM): blood, 1.61 and 0.87; meat, 1.47 and 0.86; heart, 1.66 and 1.14; tongue, 1.06 and 1.10; brain, 3.53 and 1.76; kidneys, 17.28 and 3.70; and liver, 9.15 and 3.41. SKK

### 84

**[The lead content of various tinned utensils.]**
Thiersault, J.; Laugel, P.; Hasselmann, M.
***Annales d'Hygiene de Langue Francaise, Medecine et Nutrition*** 10 (2) 193-195 (1974) [3 ref. Fr] [UER de Sci. Pharm., Univ. Louis Pasteur, Strasbourg, France]

The Pb content of the Sn coating was determined for 30 items of tinned kitchen implements (sieves, egg whisks, cake tins, wire racks, vegetable grinders, graters, etc). Tables of results are given. The results show that 25 items had Pb/Pb+Sn ratios lower than the max. legal level (0.5% = 0.5:100[?]). 2 whisks had Pb/Pb+Sn ratios of 0.61 and 1.07%; 2 skimmers had Pb/Pb+Sn ratios of 6.90 and 7.36%, and a cake rack had a Pb/Pb+Sn ratio of 17.48%. The possible health hazard from uptake of Pb by foods coming into contact with these implements is briefly considered. AJDW

### 85

**[Environmental contamination with heavy metals.]**
Umweltkontamination durch Schwermetalle.
Bergel, C.
***Deutsche Milchwirtschaft*** 28 (14, Beil, Lebensmittel-Labor) IV-VI, VIII-XII, XIV (1977) [7 ref. De]

This review-type article deals with Federal German legislation; contamination of foods with Hg, Pb and Cd; and detn. of heavy metal traces, with particular reference to AAS techniques and sample preparation procedures. Comments from own experience on AAS analysis are included. SKK

### 86

**[Polarographic determination of heavy metals in wine.]**
Popko, R.; Pietrov, S. J.[Petrov, S. I.]
***Przemysl Spozywczy*** 31 (4) 150-151 (1977) [5 ref. Pl, ru, en, fr, de] [Moskovskii Tekh. Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

Using a PPT-1 polarograph, heavy metal contents were determined in 6 samples each of port 13, and port 33 from the USSR market and of Amfora wine and 'Podczaszy' mead 'trojniak' quality) from the Polish market. The samples were dry-ashed. Mean values with SEM were, in the order of wines listed (mg/l.): Cu, 1.4 ± 0.07, 3.7 ± 0.14, 3.7 ± 0.05 and 2.4 ± 0.04; Pb, 0.10 ± 0.002, 0.25 ± 0.006, 0.20 ± 0.004 and 0.19 ± 0.005; Cd, 0.01 ± 0.0003, 0.02 ± 0.0004, 0.01 ± 0.0004 and 0; Zn, 0.60 ± 0.02, 1.15 ± 0.01, 0.78 ± 0.01 and 0.35 ± 0.07; Mn, 1.0 ± 0.002, 0.64 ± 0.01, 0.62 ± 0.02 and 0.10 ± 0.004; and Fe, 5.2 ± 0.03, 2.1 ± 0.02, 3.0 ± 0.02 and 1.4 ± 0.02. The sensitivity of the method was 0.01 mg/l. SKK

### 87

**Determination of metals in brewing materials by flameless atomic absorption spectroscopy.**
Helin, T. R. M.; Slaughter, J. C.
***Journal of the Institute of Brewing*** 83 (1) 15-16 (1977) [5 ref. En] [Dep. of Brew. & Biol. Sci., Heriot-Watt Univ., Chambers Street, Edinburgh EH1 1HX, UK]

The use of a flameless atomic absorption technique is described for the estimation of metals in malt, hops, wort and beer. The method was found to be satisfactory for the direct detn. of Mn, Mg, Ca, Fe, Zn, Cu and Al. Ni, Co and Pb were determined by the addition of internal standards. A balance sheet for 10 metals through the brewing process is presented. AS

### 88

**Plant quality response to uptake of polluting elements. [Lecture]**
Cottenie, A.; Dhaese, A.; Camerlynck, R.
***Qualitas Plantarum - Plant Foods for Human***

*Nutrition* 26 (1/3) 293-319 (1976) [29 ref. En, de] [State Univ., Ghent, Belgium]

This paper includes data for concn. of heavy metals (Pb, Zn, Cu, Cd, Cr) in various vegetables from the vicinity of a metal-processing plant and from a non-polluted zone, and for effects of washing on the concn. of heavy metals on or in vegetables. Washing commonly significantly reduced heavy metal concn. The significance of vegetables as a source of toxic heavy metals in the diet is discussed, it is concluded that hazardous heavy metal concn. are likely to occur only in plants grown in highly-polluted soil and exposed to surface contamination. [See FSTA (1977) 9 10T1369.]. AJDW

## 89

**[Heavy metals in the substrate and in mushrooms (Agaricus bisporus) fertilized with municipal waste compost.]** Schwermetallgehalte im Kultursubstrat und Erntegut des Champignons, Agaricus bisporus (Lange) Singer, beim Einsatz von Müllklarschlammkompost.
Domsch, K. H.; Grabbe, K.; Fleckenstein, J.
***Zeitschrift für Pflanzenernährung und Bodenkunde*** No. 4, 487-501 (1976) [44 ref. De, en] [Inst. für Bodenbiologie, Forschungsanstalt für Landwirtschaft, Braunschweig, Federal Republic of Germany]

Effects of incorporation of ⩽75% municipal waste compost (MWC) in a horse-dung based mushroom compost on the heavy metal content of mushrooms growth therein were studied. Heavy metal concn. in mushrooms grown in normal mushroom compost and in the mixture containing 75% MWC were, respectively (mg/kg fresh wt.); Zn, 7.80 and 9.93; Cu, 5.6 and 11.1; Pb, 0.70 and 0.92; Cd, 0.13 and 0.42; Hg, 0.13 and 0.53; and As, 0.16 and 0.16. The heavy metal contents of samples grown in the compost containing 75% MWC had Zn, Cu, Cd, As and Pb concn. within the normal range for vegetables; Hg concn. were, however, higher than those in most vegetables. AJDW

## 90

**A spectrographic method for the determination of some heavy metals and boron in plant ash.**
Parle, P. J.; Fleming, G. A.
***Irish Journal of Agricultural Research*** 16 (1) 49-55 (1977) [14 ref. En] [An Foras Taluntais, Johnstown Castle Res. Cent., Wexford, Irish Republic]

A spectrographic method based on that of Tennant [Applied Spectroscopy (1967) 21, 282] for detn. of B and heavy metals in plants is described. Fresh plant material is dried, ground, ashed, and mixed (1:1) with a spectroscopic buffer mixture comprising 7 parts $Al_2O_3$, 3 parts $CaCO_3$, and 1 part $K_2CO_3$. It is then arced in graphite electrodes, and analysed by spectrography, using an In internal standard. Detection limits were (ppm in the ash): Ag 0.1; B 1.0; Bi <1.0; Cu 3.0 or 30.0, depending on the analytical line used; Ga 1.0; Pb 1.0 or 30.0, depending on the analytical line used; Sb 20; Sn 1.0; Zn 30, Ge <1.0; Tl 1.0; and Cd 1.0. Data are given for heavy metal concn. determined in turnips, lettuce and standard kale samples by this method. Precision was better than 10% for most samples. AJDW

## 91

**Heavy metals in soils, herbage and vegetables from an industrialised area west of Dublin city.**
Fleming, G. A.; Parle, P. J.
***Irish Journal of Agricultural Research*** 16 (1) 35-48 (1977) [24 ref. En] [An Foras Taluntais, Johnstown Castle Res. Cent., Wexford, Irish Republic]

Studies on concn. of Pb, Sn, Zn, Cu, Cd and Sb in soils, herbage, field crops and garden crops in a 150 $km^2$ area on the western perimeter of Dublin are described. Tables of data are given, including values for heavy metal concn. in or on cabbage, kale, swede tops, leeks, lettuces, onions, rhubarb, spinach, potatoes, beetroot, parsley, thyme, gooseberries, strawberries, raspberries, and apples. A pot study was conducted to study uptake of heavy metals from soils by various food plants. Lettuce had the highest Cd uptake value of the vegetables studied. On the basis of comparison of the results with WHO tolerable weekly intake values for heavy metals, it is suggested that Cd presents a greater health hazard than Pb. AJDW

## 92

**The lead content of butter and casein powder.**
Murphy, J. J.; Downey, W. K.; Headon, D. R.
***Irish Journal of Food Science and Technology*** 1 (1) 67-70 (1977) [4 ref. En] [An Foras Taluntais, Moorepark Res. Cent., Fermoy, Co. Cork, Irish Republic]

Mean Pb contents (and SD) in 10 samples of sweet-cream butter and 10 of ripened-cream butter, determined by AAS, were 0.017 ± 0.016 and 0.064 ± 0.048 µg/g respectively. Mean Pb content in 12 dried casein samples was 0.208 ± 0.060 µg/g; levels detected are only 10-20% of the proposed EEC standard of 2 µg Pb/g dried casein. DMK

## 93

**Determination of tetraalkyllead compounds in biological materials.**
Sirota, G. R.; Uthe, J. F.
***Analytical Chemistry*** 49 (6) 823-825 (1977) [8 ref. En] [Environment Canada, Fisheries & Marine Service, 1707 Lower Water Street, PO Box 429, Halifax, Nova Scotia, Canada]

A fast, sensitive, AAS method for determining common tetraalkyllead compounds in fish (e.g. cod, lobster, mackerel, flounder) tissue is described. Tissue homogenates were extracted by shaking with a benzene/aqueous EDTA solution, a measured portion of the benzene was removed, and, after digestion, the residue was defatted if necessary. The resultant $Pb^{2+}$ was determined by flameless AAS using a heated graphite atomizer. Using a sample weight of 5 g, 10 ng lead as $PbR_4$/g can be determined with a relative SD of 5%. No other forms of Pb that were tested, e.g. $PbR_3X$, $PbR_2X_2$, were found to partition into the benzene layer under these conditions. A relatively high (89.7) % of total Pb as tetraalkyllead was found in a flounder meal. AS

## 94

**[Concentration of Hg, Cd, Pb and Cu in the surrounding seawater and in seaweeds, Undaria pinnatifida and Sargassum fulvellum, from Suyeong Bay in Pusan.]**
Kim, C. Y.; Won, J. H.
*Bulletin of the Korean Fisheries Society* 7 (3) 169-178 (1974) [38 ref. Ko, en] [Pusan Fisheries Coll., Pusan, Korea]

Concn. of Hg, Cd, Pb and Cu were determined in the surrounding seawater and in seaweeds, (i) Undaria pinnatifida and (ii) Sargassum fulvellum, from Suyeong Bay during the spring and neap tides in 1974. The mean and range of heavy metal concn. in the surrounding seawater were (parts/billion): Hg, 0.16 (0.00-0.39); Cd, 0.18 (0.00-0.46); Pb, 0.26 (0.00-0.94); and Cu, 0.25 (0.00-0.86). These concn. varied slightly according to the tide. The mean and range of heavy metal concn. (ppm, air dry basis) were for (i) and (ii) respectively: Hg, 0.07 (0.02-0.48) and 0.04 (0.01-0.09); Cd, 0.37 (0.14-3.2) and 0.18 (0.11-0.31); Pb, 2.3 (0.8-5.0) and 1.4 (0.8-2.2); and Cu, 3.7 (1.4-6.9) and 5.7 (3.6-13.1). The concn. rate of Hg, Cd and Pb in (i) was almost twice that in (ii) but concn. rate of Cu was slightly smaller. AL

## 95

**Health laws and regulations - Thailand.**
World Health Organization
*International Digest of Health Legislation* 28 (1) 140-155 (1977) [En] [Geneva, Switzerland]

[Continued from preceding abstr.] Notification No. 21 of the Ministry of Public Health re substances prohibited from use in food (dated 16 Jan., 1974) prescribes that the following substances may not be used in food: brominated vegetable oil, salicylic acid, boric acid, borax, calcium iodate and potassium iodate (except for use in the prevention of goitre), nitrofurazone, and potassium chlorate; Notification No. 19 of the Ministry of Public Health re characteristics, quality, and standard of pottery or enamel-ware used as a food container (dated 10 Aug., 1973), establishes a max. permissible proportion (by vol.) of Pb in the pottery and enamel-ware used as food containers; and Notification No. 20 of the Ministry of Public Health re the use of food additives and label for food containing food additives (dated 16 Jan., 1974) prescribes that food additives in the list appended to the Notification are to be used only for the prescribed purposes in the foodstuffs up to the levels specified. Other food additives are to be used as prescribed by the Ministry of Public Health. VJG

## 96

**Health laws and regulations - United Kingdom.**
World Health Organization
*International Digest of Health Legislation* 28 (1) 158-189 (1977) [En] [Geneva, Switzerland]

A selection of UK health laws and regulations is presented including the following which relate to food hygiene: The Specified Sugar Products Regulations 1976. S.I. 1976/509 (dated 26 March, 1976) have been made to implement Council Directive No. 73/437/EEC of 11 Dec., 1973; The Vitreous Enamel-ware (Safety) Regulations 1976. S.I. 1976/454 (dated 22 March, 1976) impose requirements relating to the permissible level of release of Pb and Cd from vitreous enamel articles for use with food; The Labelling of Food (Amendment) Regulations 1976. S.I. 1976/859 (dated 1 June, 1976) amend Regulation 25 (which deals with diabetic claims) of the Labelling of Food Regulations 1970; The Poultry Meat (Hygiene) Regulations 1976. S.I. 1976/1209 (dated 29 July, 1976) implement Council Directive No. 71/118/EEC of 18 Feb., 1971, on health problems affecting trade in fresh poultry meat, as amended by Council Directive No. 74/387/EEC of 15 July, 1974, and Council Directive No. 75/431/EEC of 10 July, 1975; An Act (Chapter 58) to enable the UK to accede to the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage (ATP) and for purposes connected therewith (dated 15 Nov., 1976); and The Colouring Matter in Food (Amendment) Regulations 1976, [Continued in following abstr.] VJG

## 97

**Determination of heavy metals in food. [Lecture]**
Crosby, N. T.
*IFST Proceedings* 10 (2) 65-70 (1977) [9 ref. En] [Lab. of the Gov. Chem., Cornwall House, Stamford Street, London SE1 9NQ, UK]

The principal stages in the analysis of a food for its trace metal content are discussed. The importance of obtaining a representative sample for analysis is stressed, with particular reference to the different distributions of trace metals in tea leaves and tea dust, and between the solid and liquid contents of canned vegetables. Tables of results are included with these examples. The destruction of organic matter is the next stage in analysis, and this is followed by separation and concn. of the elements of interest. AAS, flame emission and colorimetric methods are discussed as end-detn. methods. The reproducibility of the techniques is mentioned, and values for Hg and Cd contents of some selected foods are given. DIH

### 98

**Light-induced degradation of vitamins. II. Kinetic studies on ascorbic acid decomposition in solution.**
Sattar, A.; deMan, J. M.; Alexander, J. C.
***Canadian Institute of Food Science and Technology Journal*** 10 (1) 65-68 (1977) [25 ref. En, fr] [Dep. of Food Sci., Univ. of Guelph, Guelph, Ontario, Canada]

The influence of fluorescent light irradiation on ascorbic acid alone or in the presence of various metal salts in solutions was studied. The photosensitizing effect of riboflavin on ascorbic acid loss at several concn. (5-25 μg/100 ml) was investigated. There was practically no effect of light (350-750 nm) on the destruction of the vitamin in pure solutions. Addition of riboflavin significantly accelerated the decomposition of ascorbic acid. Among the metals studies, $Cu^{2+}$ and $Fe^{3+}$ markedly increased the loss of the vitamin, both with exposed or unexposed conditions. The prooxidative effect of $Cu^{2+}$ increased with increasing temp., and was relatively low under limited $O_2$ supply as compared to that in air, whereas $O_2$ supply had no influence on the effect of $Fe^{3+}$. Addition of $Zn^{2+}$, $Ni^{2+}$, $Pb^{2+}$ and $Mn^{2+}$ exhibited almost no effect under limited or excess $O_2$ availability. AS

### 99

**[Determination of lead in biological material by atomic absorption spectrometry.]**
Zmudzki, J.
***Medycyna Weterynaryjna*** 33 (3) 179-181 (1977) [4 ref. Pl, ru, en] [Zaklad Farmakologii i Toksykologii, Inst. Weterynarii, Pulawy, Poland]

The AAS method of Yeager et al. [Environmental Science and Technology (1971) **5**, 1020] for Pb detn. was tested on a large number of samples of biological material (kidney, liver, muscle, milk) and found to be precise and sensitive. Recovery of Pb added at 0.1-0.5 mg/kg to beef was 91-98%. Mean values with [?]SEM for 50 samples of human milk and 40 samples of beef kidney were respectively 0.016 ± 0.007 and 0.885 ± 0.562 mg/kg. The version of the method adapted to Polish conditions is described in detail. SKK

### 100

**[Accuracy of description of foods of plant origin.]** Deklaration und Wirklichkeit bei pflanzlichen Erzeugnissen. [Lecture]
Tangemann, R.
***Qualitas Plantarum - Plant Foods for Human Nutrition*** 27 (1) 55-58 (1977) [2 ref. De, en] [Arbeitsgemeinschaft der Verbraucher, Heilsbachstrasse 20, 53 Bonn-Duisdorf, Federal Republic of Germany]

The lack of regulations limiting heavy metal concn. in foods in the Federal Republic of Germany is critically discussed. Labelling of foods with terms suggesting purity, naturalness or freedom from contamination is also criticized; even crops grown without the use of pesticides will probably contain various environmental pollutants, e.g. heavy metals. It is suggested that future legislation should restrict these terms to foods free from all contaminants. [See FSTA (1977) 9 11A722.] AJDW

### 101

**Determination of lead in beer by atomic absorption spectroscopy.**
Weiner, J.
***Journal of the Institute of Brewing*** 83 (2) 82-84 (1977) [9 ref. En]

A method for the detn. of Pb in beer by AAS was evaluated in collaborative trials. The procedure offers a rapid technique for routine purposes but appears to have shortcomings for detn. <0.2 ppm Pb. The results for replicate detn. in a single laboratory were better than the collaborative performance. AS

### 102

**[The Pb content of wines.]**
Bertolani, G.; Mazzali, P.; Barbieri, G.; Fogliani, G.
***Industrie delle Bevande*** 6 (3) 75-76 (1977) [20 ref. It]

Pb was determined by AAS in a total of 161 samples of Italian wines (from vineyards near main roads of Pb-processing factories) in Jan., Feb., March and April 1977. A table of results is given. Mean Pb concn. (with ranges in parentheses) for the 4 months studied were (ppm): Jan. 0.69 (0.12-4.73); Feb. 0.37 (0.16-0.73); March 0.49 (0.17-1.58); and April 0.44 (0.15-1.58). The overall mean for the 4 months was 0.497 ppm. These results are discussed in relation to the max. legal concn. of Pb in wines in Italy (0.3 ppm), and the higher max. legal limits in force in many other countries. AJDW

### 103

**[Effect of increasing concentrations of Pb, Cd, Cr, Ni, or Zn on kohlrabi (Brassica aleracea L. var. gongylodes LAM) grown in nutrient solution.]** Die Wirkung steigender Gaben von Blei, Cadmium, Chrom, Nickel oder Zink auf Kohlrabi (Brassica oleracea L. var. gongylodes LAM) in Nährlösung.
Foroughi, M.; Hoffman, G.; Teicher, K.; Venter, F.
***Gartenbauwissenschaft*** 41 (6) 241-247 (1976) [27 ref. De, en, fr, ru] [Lehrstuhl für Gemüsebau, Tech. Univ. München, Weihenstephan, Federal Republic of Germany]

Investigations were carried out into the effect of increasing concn. (up to 250 ppm) of 5 heavy metals (Cd, Cr, Ni, Pb and Zn) in the nutrient solutions applied to 2 var. of kohlrabi, on their distribution in leaves, roots and tubers. Non-specific poisoning symptoms were observed for Cd from 1.5 ppm and for Ni from 2 ppm in the solution, these metals being more toxic than the remainder, although tuber yield was decreased by relatively low concn. in all cases. The metal content of the DM of leaves and tubers was positively correlated with solution concn. up to 20 ppm in all cases with the exception of Cr in the tubers, which reached a max. of 25 ppm at 1 ppm solution concn.

and declined thereafter. Cd content in the solids of both leaves and tubers reached remarkably high levels of 480 ppm in leaves and 280 ppm in tubers at only 3 ppm solution concn. Levels of Zn also increased rapidly, in about equal amounts for leaves and tubers, reaching 350 ppm at 2 ppm in the solution and exceeding 1000 ppm at 20 ppm. Pb appeared to be preferentially concentrated in the tubers and reached 90 ppm in the DM at a solution concn. of 20 ppm. BDH

### 104

**Micro-determination of lead and cadmium in pasteurized market milks by flameless atomic absorption spectroscopy using a base digest.**
Barlow, P. J.
***Journal of Dairy Research*** **44** (2) 377-381 (1977) [8 ref. En] [Dep. of Construction & Environmental Health, Univ. of Aston in Birmingham, Birmingham, UK]

Using a modified method of Barlow & Khera [Atomic Absorption Newsletter (1975) **14**, 149], 10 commercial milk samples from Birmingham were prepared for flameless AAS using Soluene 350 (Packard Instrument Co. Inc., Reading, Berks, UK), which is a quaternary ammonium hydroxide (0.5 ml pasteurized milk and 2 ml Soluene 350 made to 10 ml with Analar grade toluene); no heating was necessary. The Pb contents were all $<5$ μg/l. and mean Cd was 1.10 μg/l. Recovery of added Pb and Cd was 100 and 112% respectively. Detection limits were 5 and 0.25 μg/l. respectively using 25 μl samples. Over 3 months, 100 further samples of cartoned or bottled milk retailed by 2 large dairies in the Birmingham area have been examined. The method is rapid and reproducible. DMK

### 105

**[Chemical contamination of foods.]**
Defrancesco, F.
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** **6** (3) 205-209 (1977) [It, en] [Lab. Chimico Provinciale, Trento, Italy]

Additives and contaminants in foods are discussed. Additives considered include preservatives, antioxidants, stabilizers, $SO_2$, flavourings, yeast nutrients, surface treatment agents, and synthetic colorants. Contaminants considered include polycyclic aromatic hydrocarbons, Pb (with special reference to Pb from motor vehicle exhausts), other metals (Fe, Cu, Zn), and pesticides. AJDW

### 106

**Lead.** [Review]
World Health Organization; United Nations Environment Programme
***Environmental Health Criteria*** No. 3, 160pp. (1977) [many ref. En] [1211 Geneva 27, Switzerland]

In this publication, the biological effects and other environmental factors of Pb that may influence health are reviewed and evaluated; information, while primarily from original publications, is also derived from a number of recent reviews and from the proceedings of several symposia and meetings that have taken place in the last few yr. Following a summary which highlights the major issues and makes recommendations for further research, chapters contain the results on which the evaluation of health risks is based. These consist of sections on the physical and chemical properties of Pb and its compounds, and analytical procedures; sources of Pb in the environment; its environmental transport, distribution, levels and exposures (including via food); its metabolism, and experimental studies of its effects on animals and humans; and epidemiological and clinical studies of its effects on man, and an evaluation of health risks to man from exposure to Pb and its compounds. There is a bibliography of nearly 600 ref. DMK

### 107

**[Application of anodic stripping voltametry with glassy carbon electrode to the determination of copper and lead in beer.]**
Deldime, P.; Zieleghem, A. van
***Cerevisia*** **2** (1) 21-24 (1977) [14 ref. Fr, en, nl] [Service de Chimie Analytique de l'IIF-IMC, CERIA-Bruxelles, Brussels, Belgium]

A glassy carbon electrode, Hg-plated in situ, combined with anode stripping voltametry was used for polarographic detn. of Cu and Pb in beer. The apparatus consists of a recording instrument, a potentiostatic module and a 3-electrode fitting (glassy carbon, reference electrode of Ag-AgCl-saturated KCl, Ag counter-electrode). The analytical parameters and working conditions are described. The detn. require prior $H_2SO_4$-$HNO_3$ mineralization of the beer according to Allenby et al. [see Journal of the Science of Food and Agriculture (1975) 26, 554], and detn. by standard addition. The method had an SD of 0.6 for a mean Pb concn. of $4.1 \times 10^{-8}$M (or 15% relative SD), and an SD of 9.1 (or 8% relative SD) for mean Cu concn. of $110 \times 10^{-8}$M. It operated best at concn. of 10-100 parts/billion. Analyses of 5 beer samples gave values of 5-17 parts Pb/billion and 70-130 parts Cu/billion. RM

### 108

**Plant response to heavy metals and sulphur dioxide.**
Krause, G. H. M.; Kaiser, H.
***Environmental Pollution*** 12 (1) 63-71 (1977) [44 ref. En] [Landesanstalt für Immissions- und Bodennutzungsschutz des Landes NRW, Wallneyer Strasse 6, 43 Essen, Federal Republic of Germany]

The combined effects of $SO_2$ and heavy metals were studied by dusting Lactuca sativa L., Raphanus sativus oleifera L., Raphanus sativus radicula L. and Setaria italica L. with a mixture of CdO, $PbO_2$, CuO and $MnO_2$ once a wk for 4 wk while at the same time exposing them for the 28 days to 0.21 mg $SO_2/m^3$. Tabulated data show the accumulation of heavy metals in plant material with and without simultaneous $SO_2$ fumigation. Leaves of all plant spp. studies showed distinct heavy metal uptake, but $SO_2$ had no effect on the rate of uptake. Of the metals tested Pb concn. was highest in all plant spp. Mn uptake was low with no measured Mn absorption in L. sativa. Cd and Pb were found to be translocated down into the roots of R. sativus radicula. $SO_2$ exhibited no influence on heavy metals translocation. Of the heavy metals tested, only Cd and Pb, which are known to be hazardous to human health, accumulated in the edible plant root. In all treatments, L. sativa was the least affected plant sp. with respect to ion uptake. VJG

## 109

**Quality aspects of processed mango products.** [Lecture]
Thakur, S. P. D.; Chandhuri, D. R.; Mitra, S. N.; Bose, A. N.
***Indian Food Packer*** **30** (5) 45-50 (1976) [3 ref. En] [Dep. of Food Tech. & Biochem. Eng., Jadavpur Univ., Calcutta-32, India]

Export samples of mango products (canned mango, mango juice, pulp, slices, nectar, bottled chutney) were examined between 1971 and 1972 and 1974 and 1975. It was revealed that about 6% of the total exports of canned juice and 8% of bottled products were lost due to overfilling. Max. and min. mould counts in chutney were 72 and 20% positive fields (most samples 28-36%) but no sample was entirely free of moulds. The major metal contaminant in canned products was Sn, with 13-40 ppm in nectar, 30-95 ppm in pulp, and 31-78 ppm in juice. Pb contents were 0.45-10 ppm in mango slices in brine, 0.25-4.9 in washed slices and 0.85-2.5 in final product suggesting the salt used for curing as the major source of contamination. The commercial grade salt contained 10-15 ppm Pb. [See FSTA (1977) 9 12J1754.] RM

## 110

**[Heavy metals of mill byproducts.]** Schwermetalle in Mühlennachprodukten.
Ocker, H. D.
***Getreide, Mehl und Brot*** **31** (4) 97-100 (1977) [5 ref. De] [Bundesforschungsanstalt für Getreide- & Kartoffelverarbeitung, Detmold, Federal Republic of Germany]

The heavy metal contents of mill by-products were studied; this paper covers Pb and Cd, and further elements will be dealt with in later papers. The products analysed (approx. 100 samples in all) were wheat: grain, flour, secondary flour, fodder flour, semolina bran, bran germ; and rye: grain, flour, secondery flour, semolina bran and bran. Results are tabulated. The raw materials had low Pb and Cd contents (highest values 0.11 ppm Pb and 0.13 ppm Cd), whereas some of the by-products e.g. wheat secondary flour and bran had values $\leqslant$0.47 ppm Pb and 0.37 ppm Cd. In wheat, the Pb content increased with the ash content of the by-product; the flours had lower Pb contents than the starting grain; the Cd contents of the by-products were unrelated to ash content; and the flours had a lower Cd content than the starting grain. In rye, the concn. of Pb and Cd were not related to the ash content of the by-products; and the heavy metal content of flour was as high as in the starting grain. Rye starting grain and by-products had lower Cd contents than the wheat and wheat products; also, on average, Pb contents of rye products were lower than those of the wheat. The absolute values for all the samples for both heavy metals were low, and the Pb content was well below the legal limit of 5 ppm for fodder material. JVR

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# CONTENT AND ANALYSIS OF LEAD IN FOODS

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FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

**under the direction of**

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

# INTRODUCTION

Food Annotated Bibliographies (FABs) are collections of abstracts on specific topics in food science and technology. The topics are chosen by the staff of the International Food Information Service as being of particular interest or importance. The topics normally interest individual workers, who may not require the full information provided in Food Science and Technology Abstracts, from which the abstracts for FABs are taken. The size and the cost of the FABs are controlled as much as possible with the interests of individual workers in mind.

Titles of the FABs now available are given on the back cover of this booklet. New titles are being added at the rate of about 10 per year. For up-to-date lists of FABs or suggestions for new topics please write to the address given overleaf. New subjects are searched for at least the five most recent volumes of Food Science and Technology Abstracts. Thereafter each FAB is updated monthly. Copies of each months abstracts on any topic may be obtained as indicated on the back cover of this publication. At the end of each volume of up-dating, the abstracts are merged and made available as a separate supplement to the original FAB.

Some of the larger FABs have been divided into sections to facilitate use. Abstracts are not printed in more than one section. The larger FABs also have subject indexes provided.

Copies of all original articles referred to in the abstracts may be bought (or occasionally borrowed) from the International Food Information Service. A form for ordering these is provided at the end of this FAB.

Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES
ASSISTANT EDITOR

### 1

**[Effect of various analytical factors on the results of simultaneous determination of lead, zinc, copper and cadmium by atomic absorption spectrophotometry in selected food products.]**
Brzozowska, B.
***Roczniki Panstwowego Zakladu Higieny*** 28 (3) 275-280 (1977) [25 ref. Pl, ru, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku Panstwowego Zakladu Higieny, Warsaw, Poland]

### 2

**Dry ash-voltammetric determination of cadmium, copper, lead, and zinc in foods.**
Jones, J. W.; Gajan, R. J.; Boyer, K. W.; Fiorino, J. A.
***Journal of the Association of Official Analytical Chemists*** 60 (4) 826-832 (1977) [17 ref. En] [Div. of Chem. & Physics, FDA, Washington, DC 20204, USA]

An analytical method is presented for determining Cd, Cu, and Pb by differential pulse anodic stripping voltammetry and Zn by cathodic scan differential pulse voltammetry. Food samples are dry ashed using a sulphuric acid ashing aid, dissolved in dilute nitric acid, buffered at pH 4.3 with an acetate buffer, and quantitatively analysed using the technique of standard additions at a hanging mercury drop electrode. The quantitation limits (5 × estimated detection limits) are approx. 5 ng/g for Cd, Cu and Pb, and 50 ng/g for Zn. Accuracy of the method was established by analysis of National Bureau of Standards Standard Reference Material No. 1577 Bovine Liver, comparison of results obtained by independent analytical methods, and quantitative recovery of analyte metals from fortified, non-canned food samples (including vegetables, meat, flour, sugar, cheese and milk). Results from an inter-laboratory method trial indicate that the method is suitable for the analysis of a variety of food types. AS

### 3

**[Heavy metals in foods.]**
Ellen, G.
***Voeding*** 38 (9) 443-460 (1977) [53 ref. Nl, en] [Keuringsdienst van Waren, Leeuwarden, Netherlands]

Data (presented as tables and block diagrams) are given for concn. of Cd, Hg and Pb in numerous samples of various foods consumed in the Netherlands, including potatoes, rye and wheat flours, bread, milk and dairy products, fresh vegetables, pulses, rice and rice products, apples, pears and bottled and canned baby foods. Ranges of values for heavy meatal concn. in the products studied were (μg/kg): Cd <0.5-33; Pb 5-130; and Hg <1-65. These results are compared with literature data. Average daily intakes of heavy metals from foods are calculated, and compared with FAO/WHO recommendations. Problems of quantitative detn. of heavy elements in foods are briefly discussed. AJDW

### 4

**[Determination of lead in wines. One cause of increase: capsules.]**
Medina, B.; Guimberteau, G.; Sudraud, P.
***Connaissance de la Vigne et du Vin*** 11 (2) 183-193 (1977) [9 ref. Fr, en, de, es, it] [Sta. Agron. et Oenologique, Inst. Oenologie, Univ. de Bordeaux II, 351, Cours de la Liberation, 33405 Talence, France]

An improved method of detn. of the Pb content of wine by AAS is described, and the effect on wine of Pb foil capsules is discussed. The content of lead found in bottles of wine with capsules averaged 0.70 mg/l. vs. 0.33 mg/l. in uncapsulated bottles; the older the wine, the greater the amount (pre-1930 bottles averaged 1.70 mg Pb/l.; 1961-1973 bottles averaged 0.49 mg/l.). KME

### 5

**[Lead content of canned vegetables.]**
Catala, R.; Duran, L.; Llacer, J.
***Revista de Agroquimica y Tecnologia de Alimentos*** 17 (2) 197-208 (1977) [32 ref. Es, en] [Inst. de Agroquimica y tecnologia de Alimentos, Valencia, Spain]

The level and source of Pb contamination in Spanish canned produce were studied, together with the effect of some variables. Samples of commercially-canned vegetables, fruits and fruit juices in 4 different types of cans were analysed. Tabulated results showed that all except cucumber pickles had mean Pb contents <1 ppm, though max. levels of 1.51 and 1.30 ppm were found in some samples of canned satsumas and in peaches respectively. Canned cucumber pickles contained 1.10-8.71, mean 4.20 ppm, vs. 0.86-1.40, mean 1.10 in the bottled and <0.05 in the fresh product. The high Pb contents in cucumber pickles were attributed to the vinegar. Significantly higher Pb contents were found in products in lacquered than in those in plain tin cans. 2 yr storage tests at ambient temp. (18-22°C) or 37°C, revealed that the dissolution of Pb was significantly affected by the type of can (mainly lacquer quality), the product, storage time and temp. RM

### 6

**[Determination of lead and copper in soft and durum wheat.]**
Barbero, L.; Cavalli, G.
***Tecnica Molitoria*** 28 (5) 105-108 (1977) [5 ref. It]

A spectrophotometric method is described for detn. of Cu and Pb in soft and durum wheats. Analysis of 9 var. of durum wheat gave the following ranges of results (in terms of DM): Cu 4.58-6.10 mg/kg; Pb 0.128-0.265 mg/kg, moisture 12.6-14.2%; and ash 1.27-1.85%. Corresponding ranges for 12 var. of soft wheats were: Cu 0.55-1.84 mg/kg; Pb 0.065-0.113 mg/kg; moisture 11.5-14.3%; and ash 1.42-1.86%. The method is also applicable to bran, flour and spaghetti. HBr

## 7

**[Determination of heavy metal traces in oils, fats and animal feeds.]** Bestimmung von Schwermetallen in Ölen, Fetten und Futtermitteln.
Sagredos, A. N.
***Fette, Seifen, Anstrichmittel*** 79 (8) 331-334 (1977) [24 ref. De, en] [Fak. für Chemieingenieurwesen, Univ., Thessaloniki, Greece]

In view of W. German and EEC max. tolerances for As, Pb, Cd and Hg in fats, oils, margarine and animal feeds, methods for detn. of trace amounts were investigated. AAS was found to be the best method for detn. of Pb, Cd and Hg, and colorimetry for As. Digestion methods for each substrate are described, and recoveries and detection limits tabulated as follows: edible fats-Pb 89-100% recovery (10 µg), detection limit 0.05 ppm; Cd 83-100% (2 µg), 0.05 ppm; As 87-100% (2 µg), 0.01 ppm; Hg 93-100% (0.05 µg), 0.01 ppm; reproducibility (5 replicates) for margarine and culinary oil respectively -As 4.30 and 5.99% SD of the mean, Pb 4.94 and 1.11%, Cd 6.60 and 8.90%, and Hg 3.46 and 2.55%. [See also FSTA (1977) 9 1N2.] RM

## 8

**[Mercury, cadmium and lead contents of sea and freshwater fish.]**
Gajewska, R.; Nabrzyski, M.
***Roczniki Panstwowego Zakladu Higieny*** 28 (2) 215-224 (1977) [13 ref. Pl, ru, en] [Zaklad Bromatologii Inst. Chemii i Analityki Akad. Med. Gdansk, Poland]

The results of investigations of 646 samples of a large number of fish spp. for presence of Hg, 357 samples for presence of Cd and 492 for presence of Pb are reported. The metals were determined spectrophotometrically by the dithizone method. The fishes investigated were from the Baltic Sea, the lower Vistula and Nogat, and from various lakes in the Kaszuby Lake district. The average heavy metal levels (µg/100 g) calculated for all fishes were Hg 6.5, Cd 4.1 and Pb 19.9. The highest Hg levels were found in Vimba vimba and bream, 46.4 and 39.6 µg/100 g, respectively, caught in the Vistula river near its estuary. The Cd level was highest (15.0 µg/100 g) in soles caught in the Baltic Sea near the Vistula estuary, and the maximal Pb level (264 µg/100 g) was in European white-fish from Betyn Lake. The molar relationship of Hg to Cd and Pb was 1:1:3. AS

## 9

**[Results of food control in Switzerland in 1976.]** Die Durchführung der Lebensmittelkontrolle in der Schweiz im Jahre 1976.
Matthey, E. (Switzerland, Eidgenössisches Gesundheitsamt, Abteilung Lebensmittelkontrolle)
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** 68 (3) 279-397 (1977) [De, Fr]

727176 000 samples of 56 types of food and food ingredient as well as 330 samples of 7 types of food additives were analysed in 1976 by the Swiss Public Health authorities. Extracts from the annual reports of the 20 cantonal laboratories give detailed tables of results for each class of product. Stress is given to analysis of food additives (e.g. flavourings, antioxidants and emulsifiers) and of toxic heavy metals. [See FSTA (1977) 9 3A222 for 1975 report.] DIH

## 10

**[Investigation of a method for determining lead, cadmium, mercury, arsenic and tellurium in food by X-ray fluorescence.]** Untersuchung einer Methode zur Bestimmung von Blei, Cadmium, Quecksilber, Arsen und Tellur in Lebensmitteln mit Hilfe der Röntgen-fluorescenzanalyse.
Menke, H.
***Zeitschrift für Analytische Chemie*** 286 (1/2) 31-35 (1977) [10 ref. De, en] [Johannes Gutenberg-Univ., Inst. für Kernchemie, Postfach 3980, D-6500 Mainz, Federal Republic of Germany]

Pb, Cd, Hg, As and Te were determined in foods of animal origin after digestion with a $HNO_3$:$H_2SO_4$ (65:35) mixture in a polyethylene flask at 60° C, or preferably with $HNO_3$ in a steel vessel at 150° C, the latter method being preferred because of the small amounts of reagents required. Pb, Cd and Hg are separated by the chelating resin Chelex 100 or by precipitation with ammonium pyrrolidine dithiocarbamate, using Cu as carrier; As and Te are separated by precipitation from the filtrate with $H_2S$, using Cu as carrier. Quantitative detn. was performed by energy-dispersive X-ray fluorescence analysis, using $^{109}$Cd or $^{241}$Am sources or an X-ray tube with Zr or Mo as secondary target for the excitation. 1 µg Pb and Hg and 0.5 µg As and Te could be determined. Tabulated results showed $>90\%$ recovery of $^{109}$Cd, $^{212}$Pb, $^{203}$Hg, $^{127}$Te and $^{76}$As in tuna, beef, pork, kidney and lard following digestion with $HNO_3$ at 150° C. RM

## 11

**Decorations on glasses may pose lead hazard.**
Rawls, R. L.
***Chemical and Engineering News*** 55 (35) 23-34 (1977) [En]

Some coloured decorations on glasses are reported to contain high levels of Pb, even 7.4-10.1% Pb by wt. in one case in Massachusetts, i.e. about 151 mg Pb/glass. Pb could be leached off glasses by the acids often found in beverages or removed by children licking the glasses, scratching them, or handling them with sticky fingers. AL

## 12

**[Release of lead and cadmium from porcelain and ceramic utensils.]** Untersuchungen über die Abgabe von Blei und Cadmium aus Porzellan-und Keramikgeschirr.
Dömling, H.-J.; Kolb, C.
***Deutsche Lebensmittel-Rundschau*** 73 (8) 239-245 (1977) [17 ref. De, en, fr] [Landesuntersuchungsanstalt für das

Gesundheitswesen Nordbayern, Erlangen, Federal Republic of Germany]

A total of 1292 samples of porcelain ware and 406 of ceramic ware (1431 samples being German-produced, 267 being imported) were tested for release of Pb and/or Cd during holding in contact with a 4% acetic acid solution at 22°C for 24 h in the dark. Tables and diagrams of results are given; the results are evaluated in relation to proposed EEC guidelines (max. 1.0 mg Pb and/or 0.1 mg Cd/100 cm$^2$ for flatware, max. 5.0 mg Pb and/or 0.5 mg Cd/100 cm$^2$ for hollow ware). Overall, 7.7% of porcelain samples and 4.9% of ceramic samples exceeded these limits for Pb; corresponding values for Cd were 4.6 and 0.5% respectively. A lower proportion of imported than of German samples exceeded the guidelines. Repeated washing of porcelain ware in a washing-up machine tended to cause an increase in Pb and Cd release; with ceramic ware, an initial decrease in heavy metal release was observed, after which values remained approx. constant. Studies on replicate samples of items from the same batch showed considerable variability of Pb and Cd release. Analyses by AAS and differential pulse polarography agreed well. AJDW

## 13

**Heavy metal release from ceramic foodware.** (In 'Proceedings, International Conference on Ceramic Foodware Safety' [see FSTA (1978) **10** 2C21].) [Lecture]

Dinsdale, A.

pp. 20-27 (Undated) [En] [British Ceramic Res. Ass., Queen's Road, Penkhull, Stoke on-Trent ST4 7LQ, UK]

This paper discusses Pb release from ceramic pottery. Some factors relevant to its assessment are examined, including the British Standard specification (which involves immersion in 4% acetic acid for 24 h at 20°C, and prescribes limits of release of 2 mg/l. for holloware of > 1100 ml capacity, 7 mg/l. for holloware < 1100 ml, and 20 mg/l. for flatware), repeated extraction, the large differences in Pb yield obtained in tests compared with those from tableware in use (examples are given in a table), a statistical aspect, the problem of reconciling the criteria of industry and the consumer, and the need for international agreement. AL

## 14

**Review of European test methods for measuring lead and cadmium release.** (In 'Proceedings, International Conference on Ceramic Foodware Safety' [see FSTA (1978) **10** 2C21].) [Lecture]

Laurs, A. J.

pp. 27-36 (Undated) [En] [Ferro Corp., POB 6088, Van Helmonstraat, Rotterdam 7, Netherlands]

This review includes a table summarizing European testing methods and tolerances by country for Pb and Cd in ceramic ware, and for some countries also for Sb, Zn and Ba. It clearly shows there is still much diversity of opinion. AL

## 15

**Analytical and medical aspects of lead exposure due to lead glaze pottery.** (In 'Proceedings, International Conference on Ceramic Foodware Safety' [see FSTA (1978) **10** 2C21].) [Lecture]

Djuric, D.

pp. 40-46 (Undated) [13 ref. En] [Inst. of Occupational & Radiological Health, 11000 Deligradska 29, Belgrade, Yugoslavia]

Some experiences in Yugoslavia with Pb solubility from pottery are discussed. In some cases of poisoning of peasants due to the use of food or beverages stored in Pb glazed pottery, the original pot was tested in the laboratory by imitation of the original procedure (boiling wine or storing yoghurt, milk, cucumber salad or brandy) and determining the Pb content. The standard procedure of boiling 4% acetic acid for 30 min was then performed on some of the pottery. Results are tabulated and show the high solubility of Pb from the lead glaze, so explaining the quick development of poisoning in peasants. 3 pots used for boiling wine gave 1.372-4.950 mg Pb/100 ml when imitating the original procedure vs. 2.240-10.000 mg/100 ml by the standard test; 1 pot used for yoghurt gave 0.014 vs. 5.280 mg/100 ml resp., and 2 pots used for storing brandy and milk gave 0.810 and 0.716 mg/100 ml resp. (standard test not given). AL

## 16

**[Separation of trace elements on a cellulose exchanger with 1-(2-hydroxyphenylazo)-2-naphthol (Hyphan) as functional group and subsequent determination by X-ray fluorescence analysis.]**

Abtrennung von Spurenelementen an einem Celluloseaustauscher mit 1-(2-Hydroxyphenylazo)-2-naphthol (Hyphan) als funktionelle Gruppe und nachfolgende Bestimmung durch Röntgenfluorescenzanalyse.

Burba, P.; Lieser, K. H.

*Zeitschrift für Analytische Chemie* 286 3/4 191-197 (1977) [28 ref. De, en] [Eduard-Zintl-Inst. der TH, D-6100 Darmstadt, Federal Republic of Germany]

The separation of dissolved trace elements on a cellulose exchanger containing Hyphan as chelating group is described. In batch experiments, heavy metal ions were enriched from 100 ml solution even in the presence of 0.5M NaCl, followed by direct detn. by X-ray fluorescence. On 2 separation columns used in series Fe, Cu, Zn, Pb and U at concn. of 30, 25, 100, 2 and 10 parts/billion resp. were separated almost quantitatively from drinking water (recoveries 90-105% for Fe, Cu, Zn and U, 75% for Pb). RM

## 17

**[Content of lead in fruit and preserved fruit products.]**

Manuilova, T. A.; Spektor, L. A.

***Konservnaya i Ovoshchesushil'naya Promyshlennost'*** No. 5, 38-39 (1977) [Ru] [Moldavskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

A polarographic method for detn. of lead in fruit and preserved fruit products was used to analyse fruit grown at a research institute and fruit from preserves plants. 10 samples were analysed, except for grapes (14 samples). The lowest Pb content was in cherries (0.032-0.101 mg/kg), the largest in grapes (0.075-0.236 mg, with no differences attributable to colour). Apricots contained 0.066-0.194 and apples 0.057-0.155 mg/kg. All of 268 preserved fruit product samples analysed (after 1 yr storage), including 117 juices and 81 compotes, contained Pb; products in tin cans had higher Pb contents than similar products in glass jars. Grape juice contained 0.052-0.308, apple juice 0.027-0.80, plum compote, 0.062-0.72 and sour cherry compote 0.075-0.409 mg/kg. STI

## 18

**[Progress in atomic absorption spectrometry of fats.]**

Prevot, A.; Gente-Jauniaux, M.; Morin, O.

***Revue Francaise des Corps Gras*** 24 (8/9) 409-418 (1977) [13 ref. Fr, en, de, es] [Inst. des Corps Gras (ITERG), Paris, France]

Recent improvements in AAS instrumentation which have increased its efficiency are outlined, viz. electrodeless discharge lamps, new atomization sources (plasma), tantalum furnaces needed for some elements (Si, Sn), and control of furnace temp. Automatic sample changers for the graphite furnace improved the repeatability and the time for detn. of Fe and Cu in oils. Microcomputers allow automated calibrations. The changes in Fe, Cu and Ni concn. during oil refining are reviewed, and detn. of As, Cd, Pb, Hg and Mn in fats is described. Compared with other foods, their concn. in fats are extremely low, e.g. $<$5-35 parts/billion (ppb) Pb, 9 ppb As and 4.4 ppb Hg in margarine, $<$5-10 ppb Pb, $<$2 ppb Cd and 2.3-4.1 ppb Hg in vegetable oils, and 40 ppb Pb in virgin olive oil. [From En summ.] RM

## 19

**[Lead contents in the feed and in tissues of laying hens.]**

Renon, P.; Cantoni, C.

***Archivio Veterinario Italiano*** 28 (1/2) 49-51 (1977) [30 ref. It, en] [Istituto di Ispezione degli Alimenti di Origine Anim., Univ. degli Studi di Milano, Milan, Italy]

Data are given for Pb concn. in the tissues and eggs of 20 laying hens which had been fed diets containing 5 p.p.m. Pb for 6 months. Mean values (DM basis) were (p.p.m.): muscle 1.23; liver 1.44; bone 9.34; egg yolk 0.46; and egg white 0.74. AJDW

## 20

**[The heavy metals in food crops and in soils.]**

Hardh, J. E.

***Journal of the Scientific Agricultural Society of Finland*** 49 (3) 209-220 (1977) [25 ref. Fi, en] [Inst. of Hort., Univ. of Helsinki, Viik, Helsinki 71, Finland]

The Pb, Cd, Hg, Cu, Zn, Mn, V, As and S contents of lettuce, spinach and carrots grown at different distances from sources of pollution and in non-polluted areas were studied. Forest-grown native edible berries (Vaccinium myrtillus and V. vitis-idaea) and mushrooms, genera Boletus and Cantharellus, were also studied. Background Pb levels in soil ranged from 2.5 to 8.9 mg/kg DM. Pb contents of lettuce, spinach and carrots grown in the same soils were 0.15-3.58, 0.75-2.19, and 0.31-1.74 mg/kg DM, resp. Pb content of mushrooms grown in polluted areas was $\leqslant$ 149.9 mg/kg DM. Lettuce had the highest metal contents of vegetables tested and mushrooms had the highest metal content of native edible plants. Liming diminished Cd content of lettuce; K and Mg fertilization did not have any effect. Rinsing of lettuce 5 times in water reduced the Cd content by 44%. No marked differences between spp. were seen in Hg contents of the plants studied; the highest levels were in the polluted areas. Lettuce and spinach had higher Cu contents than carrots, and mushrooms had the highest of all plants studied. As contents were 0.11-2.68, 0.95-1.75, 0.09-2.90, 0.15-0.61 and 0.20-0.95 mg/kg DM for lettuce, spinach, carrots, berries and mushrooms resp. S, Mn and V contents are also given. [From En summ.] SP

## 21

**Thin-layer differential pulse voltammetry.**

DeAngelis, T. P.; Bond, R. E.; Brooks, E. E.; Heineman, W. R.

***Analytical Chemistry*** 49 (12) 1792-1797 (1977) [19 ref. En] [Dep. of Chem., Univ. of Cincinnati, Cincinnati, Ohio 45221, USA]

The feasibility of combining the analytical sensitivity of differential pulse anodic stripping voltammetry (DPASV) with the small vol. capability of thin-layer electrodes was demonstrated with $Pb^{2+}$, $Cd^{2+}$, $Zn^{2+}$, $Cu^{2+}$ and $Tl^{+}$. Samples of blood, soybeans (suspected of containing high levels of heavy metals) and oysters were analysed for Pb. Good agreement with results using DPASV in conventional cell was obtained for duplicate analyses of soybean digest (25 and 24 ng Pb/ml) and a single oyster sample (26 ng/ml) at a Pb level very near the detection limit of the thin-layer DPASV method (10 ng/ml). AL

## 22

**[Origins of trace contents of heavy metals in foods and feeds.]** Ursachen von Schwermetallspuren in Lebens- und Futtermitteln.

Steinle, G.

*Zucker* 30 (10) 535-540 (1977) [45 ref. De, en, fr] [Zentral-Lab. der Süddeutschen Zucker-AG, Wormser Strasse 1, 6719 Obrigheim 5, Federal Republic of Germany]

The increase of heavy metal pollution in the soil and plants, and hence in foods of plant and animal origin is discussed. Using published and own data the author presents values for As, Pb, Cd Hg, Cr, Cu, Mn, Zn, Co, Ni, Mo and Se contamination in water, soil, sugar beets and sugar factory products. RM

## 23

**Trace metal species in fresh waters.**

Florence, T. M.

***Water Research*** **11** (8) 681-687 (1977) [23 ref. En] [Analytical Chem. Sect., Australian Atomic Energy Commission, Res. Establishment, Lucas Heights, NSW, Australia]

A recently proposed trace metal speciation scheme was applied to the detn. of the chemical forms of Cu, Pb, Cd and Zn in 4 natural fresh waters and a tap water. Studies were also made on the reliability of the technique and of the effect of various methods of storage on the speciation results. The measurements showed that Cu in the river and reservoir samples was associated mainly with organic matter, probably organic colloids; Pb was divided between stable inorganic and organic forms, but 1 particular inorganic Pb sp. predominated; Cd existed almost entirely as labile ionic forms; Zn was divided between labile ionic spp. and a stable inorganic form, very little Zn was associated with organic colloids; and the trace metals were not combined with inorganic colloids. Samples stored in polyethylene containers for $>3$ wk at 25°C or 4°C showed little change in either total metal concn. or metal speciation. Freezing, however, caused some irreversible changes. AS

## 24

**Spectrophotometric determination of lead in sterilized canned evaporated milk.**

Koops, J.; Klomp, H.; Jans, J. A.

***Netherlands Milk and Dairy Journal*** **31** (4) 277-295 (1977) [33 ref. En, nl] [Netherlands Inst. for Dairy Res. (NIZO), Ede, Netherlands]

A simple and reliable spectrophotometric method, based on a dithizone/carbon tetrachloride extraction procedure, is described. The samples (5.0 g) are digested with $H_2SO_4$ and $HNO_3$, and Pb is extracted from the digests at pH 9.5 after addition of agents suitable for masking other metal ions. The organic extract is washed once with a buffer of pH 10.0 to remove any unreacted dithizone and co-extracted Bi which might be present in very small amounts in the product, due to a gradual dissolution of Bi-containing Sn. Transfers during analysis were minimized using a special attachment to the digestion flasks. Results are given of the detn. of Pb in dried milk prepared from milk with added Pb, and of Pb and Sn contents, together with extractable Bi, in commercial samples of sterilized canned evaporated milk. [In 5 samples of sterilized canned evaporated milk, stored for various period at 28°C, Pb content was 0.08-0.16 mg/kg, Sn content was 59-187 mg/kg]. AS

## 25

**[Determination of heavy metal ions in fish by the dithizone method.]**

Sheremet'eva, G. I.

***Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya*** No. 2, 144-148 (1977) [8 ref. Ru] [Khar'kovskii Inst. Obshchestvennogo Pitanyia, Khar'kov, USSR]

Contents of Pb, Hg and Cu ions in commercial fish were investigated, together with changes of these contents in raw and kitchen-processed fish. Heavy metals digestion was effected using a mixture of nitric acid and hypochlorous acid (10:1) with addition of $KMnO_4$ solution, in a closed system for 30-40 min at 100-120°C. Free oxidants were removed by means of hydroxylamine, the Hg and Cu were extracted by dithizone, and after extraction Pb was determined. The method is suitable for the detn. of Pb, Hg and Cu in fish. The ion content of the 3 metals was below the standard for commercial fish. The simplest kitchen processing did not reduce the contents of the studied ions, but they increased during baking. STI

## 26

**[Meat preserves. Smoked pasteurized bacon in slices.]**

Union of Soviet Socialist Republics, Gosudarstvennyi Komitet Standartov

***Soviet Standard*** GOST 9167-76, 3pp. (1976) [Ru]

This standard applies to salted and smoked bacon slices from the belly of carcass halves, canned and pasteurized. The product shall contain 2.5-3.5% salt, $\leqslant 100$ mg sodium nitrite/100 g, $\leqslant 100$ mg Sn salts (in terms of Sn)/kg, and no Pb salts or foreign admixtures. The standard also covers packaging, transport (refrigerated vehicles at 0-5°C) and storage ($\leqslant 75\%$ RH at 0-5°C; shelf life is 6 months). HBr

## 27

**[Effect of certain analysis factors on results of simultaneous determination of lead, zinc, copper and cadmium by atomic absorption spectrophotometry in selected food products. II. Effect of associated elements, rectilinearity of standard curves and calibration methods.]**

Brzozowska, B.

***Roczniki Panstwowego Zakladu Higieny*** **28** (4) 355-361 (1977) [9 ref. Pl, ru, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku, Panstwowy Zaklad Higieny, Warsaw, Poland]

Presence of other elements significantly affected results of simultaneous AAS determination of Pb and Cd (but not Cu and Zn) in tomato juice, mixed-vegetable juice and milk samples prepared by ashing. Addition of salts reduced the absorbance of standard solutions of Pb. For detn. in the rectilinear range of standard curves, using the Unicam SP90A spectrophotometer, measurements were restricted to $<0.3$ units of absorbance. For detn. of Pb and Cd in aqueous solutions of ash, using this spectrophotometer, calibration by addition of a standard is recommended. In detn. of Cd added to milk at 2-20 μg/l., this calibration method gave recoveries of 90-125%. Calibration with a standard curve based on an artificial ash solution gave recoveries of 75-100%, as did also calibration with a standard curve plotted without allowance for the matrix. For vegetable juice, however, these last 2 calibration methods gave recovery rates of 100-200%. [See FSTA (1978) 10 1A35 for part I.] ADL

## 28

**Food surveillance and food safety.** [Lecture]
Elton, G. A. H.
***Proceedings of the Nutrition Society*** 36 (1) 113-119 (1977) [11 ref. En] [Min. of Agric., Fisheries & Food, Horseferry Road, London SW1P 2AE, UK]

Surveillance of foods in the UK to detect chemical and microbial contamination is discussed. When investigating any given contaminant the probable intake from food is estimated, foods particularly at risk are identified, special groups of consumers at risk are identified and the possible toxicity of the contaminant is estimated. An example of this approach is given for Pb contamination. 9 groups of foods were analysed (cereals, meat, fish, fats & oils, fruit & preserves, root vegetables, green vegetables, milk and beverages) and it was found that canned baby foods averaged 0.24 mg Pb/kg compared to the average national diet content of 0.13 mg/kg. Steps were then taken to reduce Pb in canned baby foods, and when next measured Pb levels were 0.07 mg/kg. Other contaminants discussed include various other heavy metals, and nitrosamines. Salmonella is identified as the major cause of microbial food poisoning. Toxins in foodstuffs are discussed, especially aflatoxins in groundnuts. Imports are surveyed and sub-standard batches are condemned. [See FSTA (1978) 10 4C105.] DJH

## 29

**[Pb pollution of plants for human and animal consumption, caused by motor vehicle exhaust gases.]** Untersuchungen zur Bleikontamination von Nahrungs- und Futtermittelpflanzen durch Autoabgase.
Arfert, H.; Harlos, H.
***Zeitschrift für die Gesamte Hygiene und ihre Grenzgebiete*** 23 (7) 455-458 (1977) [16 ref. De, en, ru] [Bezirks-Hygiene-Inst., Neustrelitz, German Democratic Republic]

The concn. of Pb was determined by polarography in rye, 2 var. of lettuce, parsley, spinach, green cabbage, tomatoes, french beans and grass situated 5, 10, 15, 20, 25, 50 and 100 m from a main road. The highest Pb concn., 20.6 mg/kg, was found in grass nearest the road. Pb concn. fell with increased distance from the road. Lettuce grown 25 m from the road had the highest Pb concn, (1.7 mg/kg) of all the vegetables studied. It was observed that 50% of the surface deposit of Pb disappeared on washing the vegetables. Rye grains contained 1.5-0.5 mg Pb/kg. No acute danger to health is posed at present by Pb contamination of foods by car exhaust fumes, if recommendations concerning the cultivation and harvesting of such plants are observed. IN

## 30

**Differential-pulse polarographic determination of heavy metals released from ceramic glazes.**
Buldini, P. L.
***Analyst*** 102 (1221) 921-928 (1977) [17 ref. En] [CNR Lab. for Ceramic Tech., 48018 Faenza, Italy]

Inorganic oxides are commonly used for glazing ceramic were and may contaminate food and beverages. Pb, Zn and metals used for colouring purposes (e.g. Cd, Cr, Co, Cu, Fe, Mn and Ni) are leached from glazed ceramic surfaces with 4% v/v acetic acid over a 24-h period at room temp. The released metal ions are determined simultaneously in acetic acid or acetate buffers by means of differential-pulse polarography. The influence of some parameters, e.g. pH variation or the presence of surfactants, is shown. Calibration graphs are linear over the range 0-500 μg/ml. The proposed method is simple and allows easy detn. of 0.5 μg/ml of $Co^{2+}$, 0.3 μg/ml of $Cr^{3+}$, 0.1 μg/ml of Pb, $Ni^{2+}$ and $Fe^{3+}$, and 0.05 μg/ml of Cd, Cu, Zn and $Mn^{3+}$, with a precision of ±2-3%. AS

## 31

**[Determination of submicroconcentration of lead in water by atomic absorption.]**
Ott, R.
***Tallinna Polütehnilise Instituudi Toimetised*** No. 397, 79-83 (1976) [5 ref. Ru, en]

Pb was conc. from Tallinn (Estonia) mains water by extraction with 0.01% solution of dithizone (diphenylthiocarbazone) in carbon tetrachloride and determined by AAS using a Perkin-Elmer model 503 apparatus; the content of $Pb^{2+}$ was 3.8 μg/l. For comparison, the $Pb^{2+}$ content of Helsinki (Finland) mains water is quoted as 4 μg/l. SKK

## 32

**[Transfer of heavy metals in the baking chain.]**
Bittel, R.; Fourcy, A.; Godon, B.; Mourioux, G.
***Annales de Technologie Agricole*** 26 (2) 189-198 (1977) [12 ref. Fr, en] [Dep. de Protection, Commissariat a l'Energie Atomique, BP No. 6, 92260 Fontenay-aux-Roses, France]

Data are given for concn. of heavy metals (including Mg, Zn, Fe, Cu, Cd, Sr, Pb, Co, Mo and

Hg) in wheat (grown on soils subjected to various fertilizer treatments), flour, bran, dough, bread, and yeast, salt and water used in breadmaking. The results show that the flour is the main source of heavy metals in bread. A large proportion of the heavy metal content of wheat is present in the husk, and is removed in the bran fraction during milling of white flour. AJDW

## 33

**[The plasma torch: application to problems linked to the environment.]**
Leroy, M. J.-F.; Sutter, E. M. M.
***Annales des Falsifications et de l'Expertise Chimique*** **70** (755/756) 401-409 (1977) [11 ref. Fr, de, en] [Lab. de Chimie Minerale, Ecole Nat. Superieure de Chimie, 1 Rue Blaise-Pascal, 67008 Strasbourg, Cedex, France]

The plasma torch, newly developed for analytical spectroscopy, offers great advantages in detecting fractional amounts of metals in foodstuffs. It reaches higher temp. than other flame spectrometry devices (>6000° K) and can thus identify elements in a range from ng/ml to hundreds of µg/ml, enabling major and minor elements in samples in solution to be determined simultaneously. Various plasma emission sources (plasma arcs or jets from electrodes; high frequency induced plasma) are discussed, the plasma torch is illustrated and described in detail, and tables are given comparing limits of detection of various spectroscopic methods. KME

## 34

**Leaching of pewterware by organic acids.**
Gould, J. H.
***Journal of the Association of Official Analytical Chemists*** **60** (6) 1408-1413 (1977) [19 ref. En] [FDA, Div. of Chem. & Physics, Washington, DC 20204, USA]

3 pewter goblets were repeatedly leached by acetic, citric, lactic, malonic, and tartaric acid solutions. The solutions each had the same carboxyl group normality as 4% acetic acid. The leach solutions were periodically analysed for Pb, Cd, Cu, Bi, Sb and Sn by AAS. Analysis of the leach solutions showed that, without the addition of nitric or perchloric acid to the acetic and malonic acid leach solutions, Pb precipitated from the solutions on standing. Addition of the mineral acids redissolved the precipitate. Pb, Cd and Bi were found in higher concn. in the leach solution than in the alloy; Cu and Sb were less conc. in the leach, while the amount of Sn was approx. equal in both. Tartaric acid solution dissolved about 9 × as much metal from the pewter as the other organic acids but removed less Pb than acetic or malonic acids. None of these samples tested exceeded the FDA standards for Pb or Cd release. AS

## 35

**[Polarographic method for simultaneously determination of copper, zinc and lead in fruit, vegetable and their products.]**
Manuilova, T. A.; Spektor, L. A.
***Konservnaya i Ovoshchesushil'naya Promyshlennost'*** No. 3, 35-36 (1977) [Ru] [Moskovskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

Cu, Zn and Pb are currently determined in the USSR in foods by means of standard polarography in accordance with Soviet Standard GOST 5370-56; however, the inadequate sensitivity of this method to Pb is a shortcoming. For this reason, pulsation polarography (commonly used for metallurgical applications) has been tested, whereby metal concn. of the order of 1-2 powers lower can be detected. Use of a PPT-1 pulsation polarography (a. c. type) is described (covering also the apparatus and analytical procedure). Results with a range of products (grape, apple, cherry, plum, apricot juices and compotes, melon nectar) showed that the proposed method had a sensitivity of 0.01 mg/kg for Cu and Pb, and 0.02 mg/kg for Zn. STI

## 36

**Activation studies of toxic heavy metals in an agricultural ecosystem.**
Chattopadhyay, A.
***Dissertation Abstracts International, B*** **37** (12) 6041 (1977) [En] [Univ. of Toronto, Toronto, Ontario, Canada]

The concn. of heavy metals in soils, fertilizers and crops were measured by photon or thermal neutron activation analysis with high-resolution γ-ray spectrometry. Lettuce leaves contained higher levels of many toxic elements than other crops studied. Autumn crops contained higher levels of heavy metals than spring crops, especially in the case of lettuce leaves, possibly because of Pb deposition. Relationships between concn. of various pairs of metals were found in soils and crops. DIH

## 37

**[Lead content in domestic and imported chocolate and chocolate confectionery.]**
Malkus, Z.; Petriva, S.
***Listy Cukrovarnicke*** **92** (5) 113-116 (1976) [23 ref. Cs, ru, en, de] [Inst. Hyg. & Epidemiology, Prague, Czechoslovakia]

Pb content was determined colorimetrically in 79 samples of domestic and imported chocolate products and raw materials by extraction of the ash with diethyl ammonium diethyl dithiocarbaminate and exchange reaction of the lead diethyl dithiocarbamide with Cu. Tabulated results showed that 77% of all the samples contained 0.12-0.90 p.p.m.; 6 samples contained >2.0 p.p.m., of which 4 contained 2-3 p.p.m., one 3.5 p.p.m. and one 5.2 p.p.m. (the latter 2 domestic samples). RM

## 38

**Atomic absorption spectrophotometric determination of lead, cadmium, zinc, and copper in clams and oysters: collaborative study.**
Capar, S. G.
***Journal of the Association of Official Analytical Chemists*** 60 (6) 1400-1407 (1977) [7 ref. En] [FDA, Div. of Chem. & Physics, Washington, DC 20204, USA]

In the method studied by 14 collaborators, clams and oysters are dry ashed at 475° C, the ash is dissolved in dil. $HNO_3$, and Pb, Cd, Zn and Cu are determined by flame AAS. Sample solutions containing levels of Pb and Cd too low for direct AAS are extracted as the 1-pyrrolidinecarbodithioate complex into n-butyl acetate before AAS. Concn. ranges in the samples studied were: Pb, 0.06-2 p.p.m., Cd, 0.03-2 p.p.m., Zn, 40-600 p.p.m., and Cu, 5-50 p.p.m. Within these ranges, Cd levels $<0.5$ p.p.m. and Pb at all levels required extraction prior to AAS. The average coeff. of variation for Pb, Cd, Zn and Cu were, resp., 66.0, 93.2, 8.5 and 20.5% for the lowest levels and 13.5, 3.8, 6.7 and 6.8% for the highest levels. Recoveries were computed by using the sum of the average collaborative results for the totally unfortified samples plus the fortification levels as the expected concn. The average recoveries of Pb, Cd, Zn and Cu were, resp., 94.0, 99.7, 99.3 and 100.2% for the lowest fortification level and 94.8, 95.6, 96.5 and 97.5% for the highest level. High levels of Cu and/or Zn caused incomplete extraction of Pb and Cd, with Cd being affected more severely than Pb. Background corrections may be needed for determining Zn and Cd with the direct aspiration technique. No recommendation is made for official action. AS

## 39

**[Some content standards and methods of determination of trace elements in foods.]**
Wereszczynska-Cislo, B.
***Przemysl Spozywczy*** 31 (11) 412-414 (1977) [21 ref. Pl, ru, en, fr, de]

This article reviews published information on the topics named in the title and includes tabulated literature data on max. tolerance for contents of 13 trace elements in wine in France, UK, Canada, Federal Republic of Germany and Italy, and those proposed by IOV and by J. Schneider; and on heavy metal contents of 14 kinds of fruit juice. SKK

## 40

**A comparison of chemical methods for estimating Cd, Pb, and Zn availability to six food crops grown in industrially polluted soils at Odda, Norway.**
Lag, J.; Elsokkary, I. H.
***Acta Agriculturae Scandinavica*** 28 (1) 76-80 (1978) [19 ref. En] [Dep. of Soil Science, Agric. Univ. of Norway, As-NLH, Norway]

The edible parts of 6 different plant crops, potatoes, carrots, cabbage, barley, parsley and lettuce, grown in polluted soils in Odda, Norway, were analysed for Cd, Pb, and Zn. Various solvents were used for the extraction, including: 1.0N and 0.1N HCl, 1.0 and 0.1N $HNO_3$, 2.5% acetic acid, 1N ammonium acetate pH 7, 1N ammonium acetate pH 4.8, ammonium lactate solution, acid ammonium oxalate and 0.05M EDTA, and their efficiency was compared. Correlations of the analytical values of Cd, Pb and Zn in the plant crops with those in their respective soils showed that most of the tested reagents could be considered, to a varying degree, reliable for use, in analysis for the metals studied. 1.0N $HNO_3$ solution had the greatest efficiency. SP

## 41

**Technical note: lead and copper uptake by food prepared in tinned-copper utensils.**
Reilly, C.
***Journal of Food Technology*** 13 (1) 71-76 (1978) [11 ref. En] [Food Sci., Oxford Polytech., Oxford OX3 OPB, UK]

A typical restaurant luncheon was prepared using a mixture of Al, stainless steel and tinned and untinned Cu vessels. Pb contents of the courses were 0.08-0.58 mg/kg wet wt.; Cu contents were 0.35-2.73 mg/kg wet wt. Selected dishes were prepared in (i) Al, (ii) old tinned Cu-, or (iii) unused tinned Cu utensils and the Pb and Cu contents are tabulated for the different foods and utensils. The foods selected were chosen for acidity: fish simmered in oil; chicken cooked in wine sauce; red cabbage cooked in vinegar; potatoes cooked in milk; and sorbet prepared by boiling sugar and lemon juice before freezing. Metal contents found were (mg/kg dry wt.) in (i) Pb 0.36-1.91, Cu 2.26-8.40; (ii) Pb 0.66-2.00, Cu 4.43-27.01; and (iii) Pb 1.10-4.22, Cu 3.68-13.56. The significance of Pb levels in tinning is discussed, and it is suggested that the presently permitted max., 0.2% Pb in tin, be reduced or that ways be found to make the Pb less extractable. DIH

## 42

**Anodic stripping voltammetry with collection at tubular electrodes for the analysis of tap water.**
Schieffer, G. W.; Blaedel, W. J.
***Analytical Chemistry*** 50 (1) 99-102 (1978) [8 ref. En] [Dep. of Chem., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Portable, battery operated equipment is described, tested, and characterized for the performance of anodic stripping voltammetry with collection (ASVWC) at 2 Hg-coated glassy carbon tubular electrodes in series. By operating the collection electrode at a constant cathodic potential, charging current backgrounds are reduced greatly, permitting better perception of peak currents than with conventional ASV. The equipment is applied to the analysis for Cd, Pb and Cu in tap water at subnanomolar levels. AS

## 43

**[Contamination of foods of plant origin by lead-containing road dust.]** Verunreinigung von pflanzlichen Lebensmitteln durch bleihaltigen Strassenstaub.
Auermann, E.; Börtitz, S.
***Nahrung*** 21 (9) 793-797 (1977) [12 ref. De, en, ru] [Abteilung Lufthygiene, Bezirkshygiene-Inst. Karl-Marx-Stadt, German Democratic Republic]

The potential danger of contamination of fruit and vegetables with Pb from road dust during display in or in front of retail premises was studied. Pb was determined by AAS in samples of apples, pears, plums, cauliflower, lamb's lettuce, white cabbage, lettuce, spinach, and dried marjoram and savory. Pb contents of samples displayed in the shop ranged from 0.01 p.p.m. (white cabbage) to 5.1 p.p.m. (dried savory); Pb contents of samples displayed in front of the shop ranged from 0.02 p.p.m. (white cabbage) to 31 p.p.m. (dried marjoram). Most of the Pb could be removed by washing, the lowest value for Pb removal being 75% (dried marjoram). It is concluded the that Pb levels recorded present no significant public health hazard; this contamination with Pb could, however, be avoided by packaging fruit and vegetables in plastics bags, or covering them with plastics sheet during display. AJDW

## 44

**[Lead content in organs of cattle with lead poisoning.]** Bleigehalte bei bleivergifteten Rindern.
Kreuzer, W.; Kracke, W.; Sansoni, B.
***Schlachten und Vermarkten*** 77 (12) 395-402 (1977) [55 ref. De, en, fr] [Inst. für Hygiene & Tech. der Lebensmittel Tierischen Ursprungs, Veterinärstrasse 13, D-8000 Munich, Federal Republic of Germany]

The liver, kidneys, meat and spleen of 31 head of cattle with Pb poisoning were examined for Pb concn. by flameless AAS after $HNO_3/H_2O_2$ mineralization. The animals died or were emergency-slaughtered after (i) acute Pb poisoning due to intake of contaminated feed or (ii) cumulative Pb poisoning due to intake of feed from the vicinity of Pb-emitting industry or from high-Pb soils. The highest Pb contents were found in the kidney (1.91-195.0 p.p.m. fresh wt., means for groups (i) and (ii) 59.0 and 5.6, resp.) followed by liver (0.85-44.5 p.p.m., means 13.7 and 3.8, resp.), spleen (0.15-8.0 p.p.m., no means given), and meat (0.04-0.38 p.p.m., means 0.14 and 0.11, resp.). Pb contents were very high in kidneys and livers of animals from group (i). No correlation was observed between Pb contents and the severity of Pb poisoning symptoms. RM

## 45

**[Microbiological and chemical characterization of enzyme preparations.]**
Burzynska, H.; Urbanck-Karlowska, B.; Fonberg-Broczek, M.; Kwast, M.
***Roczniki Panstwowego Zakladu Higieny*** 28 (5) 425-434 (1977) [14 ref. Pl, ru, en] [Zaklad Badania Przedmiotow Uzytku, PZH, Warsaw, Poland]

A total of 39 samples of enzyme preparations consisting of 27 samples of Bacillus subtilis protease and amylase preparations imported from Denmark and Netherlands and obtained by Polish provincial sanitary-epidemiological stations during brewery control and 12 samples of B. subtilis, Aspergillus niger, Mucor miehei and papain preparations presented by the manufacturers were examined. Counts of aerobic microorganisms, and moulds and yeasts, and titres of coliforms, enterococci, and anaerobic bacilli were obtained, antibiotic activities were assessed; enzyme activities were measured; and contents of Zn, Cu, Pb, and Cd were determined. Results are tabulated for some or all of the preparations. The main conclusions were that the microbiological quality of the preparations was well within the prescribed standards; that 1% and 2% solutions of 31 of the preparations showed no antibiotic properties, but that 10% solutions or undiluted preparations inhibited growth of some test strains; and that heavy metal contents were within the normal range. SKK

## 46

**Council Directive of 4 May 1976.**
European Economic Community, Council of Ministers
***Official Journal of the European Communities*** 19 (L 126) 31-32 (1976) [5 ref. En]

EEC Directive No. 76/462/EEC of 4 May, 1976, amends for the eleventh time EEC Directive 64/54/EEC on Preservatives in Foodstuffs. The general criteria of purity have been revised as follows: they shall not contain a toxicologically dangerous amount of any element, in particular heavy metals; they shall not contain >3 mg/kg of As or >10 mg/kg of Pb; and they shall not contain >50 mg/kg of Cu and Zn taken together, of which the Zn content must in no case exceed 25 mg/kg. The following substances are added to the list of preservatives which may be authorized for use in foodstuffs in the Annex to Directive 64/54/EEC: sodium derivative of methyl p-hydroxybenzoate (E 219); potassium nitrite (E 249), use solely in a mixture with NaCl; and potassium proprionate (E 283). [See preceding abstr.] VJG

## 47

**[Heavy metals in foods - analytical studies in Austria.]** Schwermetalle in der Nahrung - Analytische Kontrolle in Österreich.
Woidich, H.; Pfannhauser, W.
***Nahrung*** 21 (8) 685-695 (1977) [De, en, ru] [Forschungsinst. der Ernährungswirtschaft, Vienna, Austria]

AAS studies on concn. of Pb (1500 samples), Cd (800 samples) and Hg and As (1200 samples) in a wide range of foods, including meat products, fish products, fruit, vegetables, cereal products, dairy products, water, beverages and fats, are described. Tables of mean values and ranges are given. Max.

heavy metal concn. recorded were (p.p.m.) Pb 0.990 (sardines); Hg 3.22 (Boletus edulis); As 29.6 (eel); and Cd approx. 1.0 (mussels). On the basis of analytical data and values for food consumption patterns in Austria, per capita monthly intakes of these heavy metals are estimated; estimates for Pb, Hg and As are below the FAO/WHO recommended limit, whereas estimates for Cd are slightly above this limit. AJDW

## 48

**[The effect of metal ions on the formation of diacetyl and acetoin by brewer's yeast.]**
Grachev, Yu. P.; Zhirova, V. V.; Ivanova, L. A.; Kovalevich, L. S.
***Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya*** No. 5, 147-149 (1977) [10 ref. Ru] [Moskovskii Ordena Trudovogo Krasnogo Znameni Tekh. Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

The effect of the typical metal ions ($Fe^{3+}$, $Zn^{2+}$, $Pb^{2+}$, $Al^{3+}$, $Cu^{2+}$, $Mn^{2+}$ and $K^+$) on biomass, diacetyl and acetoin formation by yeasts was studied. Addition of the named ions to the fermented medium in various concn., gave a product completely free of diacetyl (which has a detrimental effect on the taste and aroma of beer). Acetoin formation was considerably affected by Zn and Mn. As these trace elements may be decisive for beer flavour, attention must be given to their content in the raw materials for brewing. STI

## 49

**Survey of lead levels in alcoholic beverages and vinegars packed in PVC containers.**
Charlesworth, R. C.; Jephcott, R. W.
***Food Technology in Australia*** **29** (12) 501-502 (1977) [5 ref. En] [Australian Gov. Analytical Lab., Melbourne, Victoria 3000, Australia]

9 commercially-available types of alcoholic beverage and 3 types of vinegar were each spiked to give additions of 0.05, 0.10, 0.20, 0.30, and 0.50 mg Pb/kg, and were used in recovery tests. 110 vinegars and 56 alcoholic beverages packaged in PVC containers were also analysed. Pb was determined by a modification of the method of Zeeman & Butler [Applied spectroscopy (1962) 16, 120]. Results showed that levels of Pb in the range 0.05-0.50 mg/kg could be determined within a s.d. of 0.04. Pb levels of vinegars packed in PVC containers were well below the max. level (10 mg/kg) recommended. Pb levels of alcoholic beverages were with 2 exceptions, (Chablis wine (0.29 mg Pb/kg) and Rose wine (0.21 mg/kg) below the recommended max. level of 0.2 mg/kg. Pb levels $\geqslant$0.10 mg/kg were found in 21 (37.5%) of the alcoholic beverages. Pb contamination of the alcoholic beverages was considered not to be significant. SP

## 50

**[Effect of motorway and industrial pollution on the contents of cadmium, lead, mercury, zinc and copper in grain.]**
Bulinski, R.; Kot, A.; Kutulas, K.; Szydlowska, E.
***Bromatologia i Chemia Toksykologiczna*** **10** (4) 395-399 (1977) [16 ref. Pl, en, ru] [Inst. Analizy i Tech. Farmaceutycznej Akad. Med., Lublin, Poland]

The contents of Cd, Pb, Hg, Zn and Cu were determined in samples of wheat and rye grown 10 and 200 m from a major highway and at 1 and 2 km from various factories (cement, dyestuffs, truck-producing); wheat and rye grown 15-20 km away served as 'unpolluted' controls. Mean values (mg/kg) for the cereals grown in 'unpolluted' and 'polluted' areas, resp., were: Cd, 0.056 and 0.134 for rye and 0.050 and 0.101 for wheat; Pb, 0.053 and 0.204 for rye and 0.057 and 0.212 for wheat; Hg, 0.0019 and 0.0033 for rye and 0.0018 and 0.0042 for wheat; Zn, 14.99 and 27.82 for rye and 18.03 and 35.55 for wheat; and Cu, 3.50 and 3.27 for rye and 3.84 and 3.28 for wheat. Thus, only Cu was unaffected by proximity to the sources of pollution, all the other metals showing considerable increases in concn. HBr

## 51

**Decrease in content of lead in Danish cereals.**
Solgaard, P.; Aarkrog, A.; Fenger, J.; Flyger, H.; Graabaek, A. M.
***Nature, UK*** **272** (5651) 346-347 (1978) [8 ref. En] [Riso Nat. Lab., DK-4000 Roskilde, Denmark]

An overall decline is reported in the Pb content of 3 cereals (spring and winter wheat and barley, sampled from 10 state experimental farms throughout Denmark) and total diet samples (collected from 8 zones covering Denmark) between 1962 and 1976. Samples were dry ashed at 500°C for 24 h, stored in polyethylene boxes, and analysed by optical emission spectroscopy. Pb concn. found were about 40-120 μg/kg fresh wt. in cereals and 8-15 μg/kg fresh wt. in total diet (corresponding to a daily intake in uncooked food of 23-43 μg/person). Concn. increased only in grain from 1 farm north of Copenhagen where traffic is heavy; values were approx. 50% above average. The effect of restrictions on the use of Pb additives in petrol and the type of fertilizer used in agriculture are briefly discussed. AL

## 52

**[Effect of various analytical factors on the results of simultaneous determination of lead, zinc, copper and cadmium by atomic absorption spectrophotometry in selected food products. III. Method for simultaneous determination of lead, cadmium, copper and zinc in juices and milk.]**
Brzozowska, B.
*Roczniki Panstwowego Zakladu Higieny* 28 (5)

441-449 (1977) [Pl, ru, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku, PZH, Warsaw, Poland]

On the basis of finding reported in parts I and II [see FSTA (1978) **10** 1A35 and 4A244], simultaneous estimation of Pb, Cd, Cu and Zn in samples of orange juice, mixed-vegetable juice and milk was studied. It was found that using 1 batch of ashed material, Pb and Cd could be determined by AAS by the internal standard method and Cu and Zn could be determined by the standard curve method. Sensitivity and accuracy of the methods are discussed. Mean values for contents of Pb in 2 samples of orange juice, 1 of mixed-vegetable juice, and 1 of milk were resp. (mg/l.): 0.250, 0.250, 0.160 and 0.060; and for Cd they were resp. (µg/l.): 26, 23, 9 and 20. For contents of Cu in 2 samples of orange juice, 1 of mixed-vegetable juice and 2 of milk the values were resp. (mg/l.): 0.152, 0.055, 0.800, 0.185 and 0.107; and for Zn they were resp. (mg/l.): 0.53, 0.34, 1.37, 4.25 and 3.78. Cu and Zn could also be determined in unsweetened fruit or vegetable juices without previous mineralization. SKK

## 53

**Determination of lead in atmospheric particulates using an automated atomic-absorption spectrophotometric system with electrothermal atomisation.**

Pickford, C. J.; Rossi, G.

***Analyst*** **103** (1225) 341-345 (1978) [13 ref. En] [Commission of the European Communities, Euratom CCR, Ispra Establishment, Chem. Div., 21020 Ispra (Varese), Italy]

A laboratory constructed automatic sampling system is used for the detn. by AAS with electrothermal atomization of $\leqslant 50$ air particulate samples, after acid dissolution. When used on a routine basis, the method results in high precision and permits a large number of samples to be analysed in min. time without operator attendance. The system can also be used for analysis of many environmental samples, e.g. waters and effluents, and in biological applications. AL

## 54

**A study of selected heavy metals in the Grand Calumet River-Indiana Harbor Canal system.**

Romano, R. R.

***Dissertation Abstracts International, B*** **38** (2) 570-571: Order No. 77-15464, 221pp. (1977) [En] [Purdue Univ., West Lafayette, Indiana 47907, USA]

Measurements of heavy metal content of a river-canal system showed that large amounts are transported into Lake Michigan: Cd 1.1 ± 0.3; Pb 21 ± 5; Zn 83 ± 15; and Fe 1090 ± 180 (tons/yr ± 1 s.e.). This may affect domestic water supplies of cities. DIH

## 55

**[Contents of heavy metals in brewer's yeast.]**

Szmelich, W.

***Przemysl Fermentacyjny i Rolny*** **21** (10) 9-12 (1977) [19 ref. Pl, ru, en, de] [Biskupiec Reszelski, Poland]

Contents of metals in yeasts from 8 breweries were determined. As, Pb and Cu were determined in a yeast slurry which contained 10% DM. Metal concn. in the slurry and on a DM basis resp. were As, 0.06-0.25 and 0.62-2.50 mg/kg; Pb, 0-0.16 and 0-1.55 mg/kg; and Cu, 1.00-3.79 and 10.0-37.9 mg/kg. The mean content of Cu was within the limits permitted by Polish standards for brewer's yeast. The Cu content was high in the brewer's yeast, as Cu vessels are still in use in the boiling house. STI

## 56

**Determination of lead in plants.**

Shamsipoor, M.; Wahdat, F.

***Zeitschrift für Analytische Chemie*** **288** (3) 191-192 (1977) [4 ref. En, de] [Dep. of Chem., Arya Mehr Univ. of Tech., PO Box 3406, Tehran, Iran]

A new method was developed for detn. of Pb in plants. The dried ground sample is heated in $O_2$ at 280-450° C to decompose organic material, the Pb then reduced by a stream of $H_2$ at 1000° C to elemental Pb which sublimes and condenses in a capillary. The sublimed Pb is dissolved in $HNO_3$ and its concn. determined by AAS. Results of analyses on 8 types of vegetables showed deviations of +13.8 to +21.2% (mean 17%) from results obtained by Lachica's method for Pb contents of 1.80-8.25 p.p.m. RM

## 57

**[Colorimetric method for determining lead in dairy products.]**

Davydova, I. R.; Stepanova, N. S.

***Gigiena i Sanitariya*** No. 3, 88-89 (1978) [1 ref. Ru] [Vses. Nauchno-Issled. Inst. Molochnoi Promyshlennosti, Moscow, USSR]

A method is described for determining Pb in dairy products (milk, cultured milk beverages, condensed milk, dried milk and dried products for infant feeding). It involves co-precipitation of Pb as a sulphate with $SrSO_4$; dissolving the precipitate in sodium polymetaphosphate solution; formation of coloured solutions of lead dithizonate; and colorimetric detn. using a calibration curve. Sensitivity of the method is claimed to be 0.04 mg/kg for milk and 0.1 mg/kg for condensed or dried milk. Recovery was 80% for sweetened condensed milk containing 0.20 mg Pb/kg. ADL

## 58

**The distribution and effects of selected heavy metals in a contaminated lake.**

Bishop, W. E.

***Dissertation Abstracts International, B*** **38** (2) 567:

Order No. 77-15379, 160pp. (1977) [En] [Purdue Univ., West Lafayette, Indiana 47907, USA]

The contaminated lake (Little Center Lake, in N.E. Indiana, USA) contained Cd, 3.2 μg/l.; Zn, 139 μg/l.; and Pb, 18 μg/l. Cd, Zn and Pb concn. in bluegill and pumpkinseed (Lepomis gibbosus) fish were significantly higher than those in fish from uncontaminated lakes. DIH

## 59

**Distribution of heavy metals in the northern shrimp Pandalus borealis from the Oslo fjord.**

Neelakantan, B.

***Fishery Technology*** 13 (1) 20-25 (1976) [10 ref. En] [Inst. of Marine Biol., Univ. of Oslo, Oslo, Norway]

Samples of the shrimp Pandalus borealis were collected at 6 sites in Oslo fjord, (Mokkalasene, Elle, Holmestrandsfjord, Bolarne, Faerder and Torbjornskjaer) during Jan.-March 1973, and analysed for Cu, Cd, Zn and Hg. Tables of results are given showing moisture, contents, heavy metal concn. at the locations studied, moisture and heavy metal contents subdivided according to the body length of the shrimps, and moisture and heavy metal contents of individual tissues. Mean concn. of the individual heavy metals were (μg/g DM): Cu 95, Cd 0.9, Pb 2.7, Zn 103, and Hg 0.4. Concn. of all heavy metals studied were higher in the inner and middle fjord than in the outer fjord. Sex and body size seemed to significantly influence Pb and Zn concn., but not Cu, Cd or Hg concn. Considerable differences in heavy metal concn. between individual tissues were observed, hepatopancreas, gills and eggs generally having the highest levels (except that eggs have low concn. of Cu and Hg). Muscle has a relatively low heavy metal concn. AJDW

## 60

**Heavy metals in cultivated oysters (Crassostrea commercialis -Saccostrea cucullata) from the estuaries of New South Wales.**

Mackay, N. J.; Williams, R. J.; Kacprzac, J. L.; Kazacos, M. N.; Collins, A. J.; Auty, E. H.

***Australian Journal of Marine and Freshwater Research*** 26 (1) 31-46 (1975) [17 ref. En] [New S. Wales Fisheries Branch, Box 30 GPO, NSW 2001, Australia]

Concn. of Cu, Zn, Cd, Pb and As were determined in oysters (20 per sample) (i) from 19 important production areas at 1.5, 2.5 and 3.5 yr old, and (ii) from 5 sites in the Georges River. Results of chemical and statistical analysis are shown graphically and in tables. The mean, min. and max. concn. of the 5 metals (ppm wet wt.) for (i) were respectively: 20 (3-48), 277 (80-665), 0.2 (0.1-1.0), 0.8 (0.3-1.3) and 1.2 (0.3-3.4), i.e. well within the National Health and Medical Research Council recommendations of 30, 1000, 2.0, 2.0 and 1.14 (except for 10 Cu homogenates and 2 As concn. of 3.1 and 3.4 in an area with no known industrial pollution). The Cu, Zn and Cd concn. decreased with increasing wet wt. and age, but total amounts increased, e.g. mean Cu concn. from 37.9 ppm at 5 yr to 34.5 at 2.5 and 27.3 at 3.5 yr. Cd from 0.34 to 0.21 and 0.21, respectively. In oysters sampled from a single estuary, a gradient of increasing metal concn. was observed with increasing distance upstream from the sea. The variability of metal concn. in oysters is discussed and a sampling method suggested for monitoring the levels. RM

## 61

**Strontium and lead in the Hopi nutritional environment and teeth.**

Kühnlein, H. V.

***Dissertation Abstracts International, B*** 38 (2) 597: Order No. 77-15745, 199pp. (1977) [En] [Univ. of California, Berkeley, California 94720, USA]

High concn. of many mineral elements, including Sr and Pb, occur in traditional foods of the Hopi, a native American group of N.E. Arizona. Consumption of a cornmeal-ash food contributes toward a daily intake of 3-4 mg Sr/day, higher than any reported to date for the USA. Pb levels of traditional Hopi foods are presented; daily intake is estimated to be <200 μg/day. A roadside clay consumed by children contained 74 p.p.m. Pb. DIH

## 62

**Analytical aspects of mercury and other heavy metals in the environment.** [Book]

Frei, R. W.; Hutzinger, O. (Editors)

vii + 196pp. ISBN 0-677-15890-4 (cloth) (1975) [many ref. En] London, UK; Gordon and Breach Science Publishers Ltd. Price £16.70 [Pharmaceutical Dep., Sandoz Ltd., Basel, Switzerland]

This book should prove useful to scientists not well acquainted with heavy metal pollutants or those working in areas which make use of heavy metal analysis such as biology, geology, oceanography, medicine toxicology and pharmacology. Papers included are: Use of mercury in agriculture and its relationship to environmental pollution, by J. G. Saha & K. S. McKinlay (pp. 1-20, 78 ref.), including Hg residues in cereals, fruit, tomatoes, potatoes, meat and eggs, and fish; The microdetermination of mercury and organomercury compounds in environmental materials, by J. F. Uthe & F. A. J. Armstrong (pp. 21-53, 238 ref.): Determination of trace levels of mercury in effluents and waste-waters, by K. H. Nelson, W. D. Brown & S. J. Staruch (pp. 77-88, 8 ref.); A radiochemical method for selective determination of traces of lead, by J. Stary & K. Kratzer (pp. 105-110, 6 ref.); Determination of lead, cadmium, copper and zinc in biological materials by anodic stripping polarography, by I. Sinko & L. Kosta (pp. 111-122, 12 ref.) including bovine liver, kale and carrots; Determination of traces of antimony by flameless atomic absorption spectroscopy, by B. E. Schreiber & R. W. Frei (pp. 123-130, 19 ref.);

Determination of some transition metals (including Cd, Cu and Zn in tap water) by atomic absorption spectroscopy after extraction with pyridine-2-aldehyde-2-quinolyl-hydrazone, by R. W. Frei, T. Bidleman, G. H. Jamro & O. Navratil (pp. 131-139, 10 ref.); and The determination of trace transition elements in biological tissues using flameless atom reservoir atomic absorption, by D. A. Segar & J. L. Gilio (pp. 141-151, 26 ref.), including Ag, Cd, Co, Cu, Fe, Mn, Ni, Pb, V and Zn. VJG

### 63

**Lead contents of crop plants growing in the vicinity of a lead smeltery.**

Erviö, R.

***Annales Agriculturae Fenniae*** 16 (3) 172-176 (1978) [10 ref. En, fi] [Agric. Res. Cent., Inst. of Soil Sci., SF-01300 Vantaa 30, Finland]

Pb contents were determined in crop samples collected in late summer, 1970 from 104 sites in the vicinity of a Pb smeltery in Southern Finland and, as the control, from 36 sites in the surrounding countryside. Results were for polluted area and control area resp. (p.p.m. in DM): sugar beet tops, 45.2 and 6.8; sugarbeet roots, 1.1. and 0.5; potato tubers, 0.9 and -; barley grain, 1.23 and 0.78; turnip-rape tops, 26.7 and 6.2; oat grains, 1.02 and 0.60; spring wheat grain, 0.75 and 0.59; winter wheat grain, 0.55 and -; and winter rye grain, 0.41 and 0.50. In Finland max. permitted levels of Pb in human food have not been specified except for canned fruit. In UK max. Pb levels are specified as 2 mg/kg. Grain samples collected in the polluted area contained at least 1 mg Pb/kg in 22 instances and >2 mg Pb/kg DM in only 3 instances. SP

### 64

**Influence of ascorbic acid on the matrix interferences observed during the carbon furnace atomic-absorption spectrophotometric determination of lead in some drinking waters.**

Regan, J. G. T.; Warren, J.

***Analyst*** 103 (1226) 447-451 (1978) [3 ref. En] [Dep. of Ind., Lab. of Gov. Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK]

9 samples of drinking water taken from a range of locations in England and Scotland were analysed for Pb by using carbon furnace AAS. Spiking experiments were carried out to determine the severity of the matrix interference. Suppression of the Pb signals ranged from 22 to 84%. No relationship was found between the hardness of a water sample and its suppression effect. Further spiking experiments in the presence of 1% w/v ascorbic acid showed that the suppression effect of 8 of the water samples was reduced to <5%, the remaining sample gave a suppression of 18%. This water was not the hardest examined, nor did it give the highest suppression in the previous experiment. The natural Pb contents of the 9 waters were determined both by carbon furnace AAS in the presence of ascorbic acid and by a method involving solvent extraction-flame atomic absorption. Statistical analysis, using a t-test, indicated that there was no significant difference (at 95% confidence level) in the results obtained by the 2 techniques. AS

### 65

**[Method for determining micro amounts of heavy metals in fruit juices.]**

Es'kina, O. V.; Gozhaya, L. D.; Manova, T. G.

***Gigiena i Sanitariya*** No. 3, 90 (1978) [1 ref. Ru] [Moskovskii Med. Stomatologicheskii Inst., Moscow, USSR]

The method involves ashing the sample, with subsequent measurement of the spectra (using an ISP-30 spectrograph) at 283, 325 and 326 nm for Pb, Cu and Sn, resp. The sensitivity of the method is $1 \times 10^{-6}$%. HBr

### 66

**[Technological possibilities for reduction of lead residue levels in juices from severely contaminated apples.]** Technologische Möglichkeiten zur Reduzierung der Bleirückstände in Säften aus stark kontaminierten Äpfeln.

Hensel, W.; Gierschner, K.

***Deutsche Lebensmittel-Rundschau*** 74 (5) 193-200 (1978) [51 ref. De, en, fr] [Inst. für Spezielle Lebensmitteltech., Univ. Hohenheim, Stuttgart, Federal Republic of Germany]

Samples of Golden Delicious apples grown (i) 10 m or (ii) 400 m from a road and samples of (iii) Cox's Orange Pippin and (iv) McIntosh apples artificially contaminated by exposure to car exhaust gases for 7 h were used in studies on distribution of Pb in apples, and elimination of Pb during apple juice manufacture. Pb concn. of whole unwashed apples were (µg/g TS): (i) 1.0, (ii) 0.4; (iii) 6.1 and (iv) 5.6. Pb concn. in the fruit flesh were, for (i)-(iv) resp. (µg/g TS): 0.3; 0.2; 0.1; and 0.2. Effects of washing (iii) and (iv) in tap water, 1% citric acid, 1% tartaric acid or 0.1% EDTA solution were studied. % residual Pb on the apples for these 4 treatments, resp., were for (iii) 43, 18, 16 and 14; and for (iv) 69, 52, 51 and 33. Studies were conducted on changes in Pb concn. at various stages of juice extraction and processing. The results show that 80% of the Pb remained in the pressing residue; of the 20% passing into the juice, a large proportion is eliminated during centrifugation and clarification. It is concluded that, even with severely contaminated apples, juice containing <0.3 mg Pb/l. may be manufactured. AJDW

### 67

**[The heavy metal contents of fresh fruits.]**

Basile, G.; Palmieri, F.

***Industria Conserve*** 52 (1) 46-48 (1977) [21 ref. It] [Istituto di Chimica Agraria dell'Univ. de Napoli, Portici, Italy]

The Pb, Cu, Zn, Sn and Fe contents of freshly picked sweet and sour cherries, apricots and peaches from the Campania region were determined by AAS. Tabulated results showed that mean values for 4 of the metals were consistent with the concn. reported in the literature, but mean Pb contents (from 0.10 p.p.m. for peaches to 0.16 p.p.m. for apricots) were higher than those found in different areas, suggesting greater Pb pollution. The following min., max. and mean values were obtained (p.p.m.): Pb, 0.04, 0.23, 0.10-0.16; Cu, 0.52, 1.76, 0.84-1.34; Zn, 0.71, 3.20, 1.06-1.73; Sn, 3.82, 19.20, 7.73-10.97; and Fe, 1.92, 23.60, 4.65-17.29. RM

## 68

**[Heavy metal contents of pasta filata cheese in Campania.]**

Basile, G.; Tarallo, V.; Violante, P.

***Bollettino dei Chimici dei Laboratori Provinciali*** 4 (1) 38-46 (1978) [18 ref. It, en, de, fr] [Istituto Zooprofilattico Sperimentale per il Mezzogiorno, Portier, Italy]

135 soft pasta filata cheese samples were wet ashed and analysed by AAS for Pb, Cu, Zn, Fe and Cr contents. 6.2% of the samples contained >1.0 mg Cu/kg, 12.6% >45.0 mg Zn and 10-20 mg Fe/kg. These high values are attributed to the use of unsuitable galvanized iron containers for milk transport and storage. No sample contained >0.60 mg Pb/kg or >0.19 mg Cr/kg. RM

## 69

**[Polarographic determination of Pb in fish.]**

Sheremet'eva, G. I.; Babich, G. A.; Pashneva, L. I.

***Izvestiya Vysshikh Uchebnykh Zavedenii. Pishchevaya Tekhnologiya*** No. 6, 143-145 (1977) [4 ref. Ru] [Khar'kovskii Inst. Obshchestvennogo Pitaniya, Khar'kov, USSR]

Amalgam polarography with stationary Hg droplet electrode was used for detn. of Pb in fish: the method has a high resolving power ($10^{-8}$ to $10^{-9}$M), is simple and has good reproducibility without need for high-purity chemicals. Pb contents in fresh (0.030 mg/kg), baked (0.050 mg/kg) and waste (0.030 mg/kg) fish were in a good agreement with those obtained using the dithizone method. The method can be recommended for Pb detn. in other biological material. STI

## 70

**Heavy metals, selenium and arsenic in nine species of Australian commercial fish.**

Bebbington, G. N.; Mackay, N. J.; Chvojka, R.; Williams, R. J.; Dunn, A.; Avty, E. H.

***Australian Journal of Marine and Freshwater Research*** 28 (3) 277-286 (1977) [23 ref. En] [NSW State Fisheries, 211 Kent Street, Sydney, NSW 2000, Australia]

Metals levels were determined in samples of muscle tissue from 9 spp. of commercial fish accounting for about 30% of the commercial catch. 20-30 individuals from each species were analysed for Hg, Cd, Pb, Cu and Zn, and 8-12 for Se and As. Of the 232 fish analysed, 231 had Cd, Pb, Cu and Zn concn. below the National Health and Medical Research Council (NHMRC) standards. 16 specimens of bream, snapper (Chrysophris auratus), mulloway (Sciaena antarctica), kingfish, Australian salmon and yellowfin tuna had total Hg concn. >0.5 p.p.m. (NHMRC standard), with max. of 1.94 p.p.m. in snapper. These fish accounted for about 7% of the total sampled. Virtually all the Hg was present as methylmercury. Of the 95 fish analysed for As and Se, 20 (21%) had As concn. ≥ the NHMRC standard of 1.5 p.p.m. $As_2O_3$ (equivalent to 1.14 p.p.m. As), with max. 4.4 p.p.m. in a snapper. The results suggest that metal contents in fish do not constitute a serious health hazard. RM

## 71

**Evaluation of a method for the determination of total cadmium, lead and nickel in foodstuffs using measurement by flame atomic-absorption spectrophotometry.**

Evans, W. H.; Read, J. I.; Lucas, B. E.

***Analyst*** 103 (1227) 580-594 (1978) [22 ref. En] [Dep. of Ind., Lab. of Gov. Chem., Cornwall House, Stamford Street, London SE1 9NQ, UK]

In the method described, organic matter is destroyed using a wet-digestion procedure and Cd, Pb and Ni are concentrated by chelation with a mixture of ammonium tetramethylenedithiocarbamate and diethylammonium diethyldithiocarbamate and extraction from an acidic solution with 4-methylpentan-2-one; measurement is by flame AAS. The accuracy of the method is assessed, ionic interferences noted and s.d. calculated both for the method itself and the method in application, for levels likely to be encountered in foods. Confidence intervals and detection limits were deduced from the results obtained for each element. AS

## 72

**[Lead uptake of fruit and vegetable juice in open cans.]** Bleiaufnahme von Frucht- und Gemüsesäften in geöffneten Dosen.

Bielig, H. J.; Askar, A.; Treptow, H.

***Lebensmittel-Wissenschaft und -Technologie*** 10 (5) 282-284 (1977) [8 ref. De, en] [Inst. für Lebensmitteltech.- Frucht- & Gemüsetech., Tech. Univ. Berlin, Königin-Luise-Strasse 22, D-1000 Berlin (West) 22]

Pb uptake of canned fruit and vegetable juices was investigated using flameless AAS, with special reference to pH, storage temp., and lacquer coatings. The Pb content just after opening averaged less than 400 parts/billion. The lower the pH value the higher was the subsequent uptake in opened cans. Thus, the Pb increase in vegetable juice was less than that in fruit juice. While Pb uptake increased greatly in unlacquered open cans containing orange or tomato juice, no increase, or a much smaller increase, was observed in lacquered cans containing the same juices. Storage at 4°C surprisingly resulted in higher Pb increases than storage at room temp. MJD

## 73

**[Comparison of sample preparation methods for quantitative determination of heavy metals in fruit juices by flameless atomic absorption spectroscopy.]** Vergleich von Probenaufbereitungsverfahren beim quantitativen Nachweis von Schwermetallen in Fruchtsäften mit der flammenlosen Atomabsorptionsspektrometrie.
Harbach, D.; Diehl, H.
***Zeitschrift für Analytische Chemie*** 290 (2) 145-146 (1978) [De] [Univ. Bremen, Postfach 330 440, 2800 Bremen 33, Federal Republic of Germany]

The following 3 sample preparation methods for flameless AAS detn. of heavy metals in fruit juice were compared: (i) direct ashing in graphite furnace, (ii) wet ashing by 0.1N $HNO_3$, and (iii) vacuum drying followed by high-frequency/low-temp. ashing, using recovery tests with 0.05-0.20 p.p.m. Pb. Analysis of variance was used to exclude systematic errors in the sample preparation methods. Pb contents in 10 fruit juices were 0.076 p.p.m. (s.d. 0.013 p.p.m.) by methods (i) and (iii), and 0.077 (0.019) by method (ii), showing that prior ashing of samples is unnecessary. Method (i) is preferred for routine analysis. Max. Pb content in 20 different fruit juices was 0.211 ± 0.013 p.p.m. in a grape juice (WHO tolerance limit 0.3 p.p.m.). RM

## 74

**Cadmium, lead and nickel content of Lycoperdon perlatum Pers. in a roadside environment.**
McCreight, J. D.; Schroeder, D. B.
***Environmental Pollution*** 13 (4) 265-268 (1977) [15 ref. En] [Univ. of Connecticut, Storrs, Connecticut 06268, USA]

The investigation was undertaken because of the growing trend in USA to gather wild edible spp. of fungi, combined with the known contamination of soils and vegetation adjacent to highways and in urban areas with Cd and Pb; the object was to determine whether sporophores of the fungi accumulate Cd, Pb and Ni. 20 specimens of the puffball Lycoperdon perlatum Pers. were collected from grassy areas within 23-34 m of a major highway. Some whole sporophores were washed with a detergent-wetting agent to reveal any easily removable surface accumulation of metals. Relative amounts of metals were determined in the peridium, internal gleba and base of individual sporophores. Samples were wet-ashed by nitric-perchloric acid and the analyses were made by AAS. Ni was detected in only 1 sample (concn. 2.37 p.p.m.), Cd and Pb were found consistently on the outer surface or in the gleba with no differences between washed and unwashed samples. The major location of metals was on or in the peridium. In the gleba low amounts of Cd were found consistently, but Pb only once. No Cd or Pb was found in the base of any sporophore. The range of concn. (p.p.m.) in different parts was Cd 0.00-5.34 and Pb 0.00-80.98. It is concluded that the source of metals in via aerial deposition and penetration rather than the soil. ELC

## 75

**[Incidence of toxic heavy metals (cadmium, lead, zinc and mercury in mushrooms.]** Zum Vorkommen von toxischen Schwermetallen (Cadmium, Blei, Zink und Quecksilber) in Pilzen.
Woggon, H.; Bickerich, K.
***Nahrung*** 22 (3) K13-K15 (1978) [5 ref. De]
[Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

The heavy metal contents of wild mushrooms (including Agaricus arvensis and A. bitorguis) were compared with those of cultivated mushrooms. Cd contents were 32.2, 3.75 and 0.30 mg/kg DM, resp. The Pb and Hg contents were also higher in A. arvensis than in the cultivated mushrooms, viz. 3.46 vs. 1.38 and 2.94 vs. 0.53 mg/kg, resp. Only for Cd was the tolerance for heavy metals exceeded, viz. by 5-10 × in the case of A. arvensis. Continued, high-level consumption of this var. of wild mushroom is not recommended. IN

## 76

**[Pb in canned fruit and vegetables.]** Bleigehalt in Frucht- und Gemüsekonserven.
Treptow, H.; Askar, A.; Bielig, J.
***Lebensmittelchemie und Gerichtliche Chemie*** 32 (3) 63-66 (1978) [31 ref. De] [Inst. für Lebensmitteltech., Tech. Univ. Berlin, Königin-Luise-Strasse 22, 1000 Berlin (West) 22, Federal Republic of Germany]

56 samples of canned fruit and vegetables and fruit and vegetable juices were analysed for Pb by flameless AAS. A table of results is given. The highest Pb concn. were 3298 parts/billion (p.p.b.) in Italian tomato puree. Most other products contained $\leqslant$400 p.p.b., apart from Italian fruit cocktail (414 and 433 p.p.b.), a vegetable juice from the USA (780 p.p.b.) and beans from the USA and Federal Germany (550 and 490 p.p.b., resp.). Most fruit and vegetable juices contained $\leqslant$300 p.p.b.. In general, Pb concn. in the fruit or vegetable itself were considerably higher than in the canning syrup or liquor. Products in lacquered cans tended to have higher Pb concn. than those in non-lacquered cans. No clear relation between pH of and Pb concn. in the can contents was observed. AJDW

## 77

**[Lead contamination of plants adjacent to roads in relation to the provision of wind screens at the side of the road.]** Verkehrsbedingte Bleikontamination von Kulturpflanzen in Strassennähe in Abhängigkeit von Bepflanzungen am Strassenrand. [Lecture]
Collet, P.

*Qualitas Plantarum - Plant Foods for Human Nutrition* 28 (2) 1871-94 (1978) [6 ref. De, en] [Chem. Untersuchungsamt für das Saarland, Charlottenstrasse 7, 6600 Saarbrücken, Federal Republic of Germany]

Studies were conducted on the Pb content of leeks, lettuce and savoy cabbage grown 5, 25, 75, 100 or 200 m from a main road, in the vicinity of a set of traffic lights. Some of the plants were partially protected from wind-borne Pb by a screen of closely-planted trees and shrubs. Tables and diagrams of results are given. Pb concn. ≤212 parts/billion (fresh wt. basis) were observed in the vegetables. In general, Pb concn. tended to decrease with increasing distance from the road. Plants grown behind the wind screen had Pb levels 30-50% lower than those of directly-exposed plants at the same distance from the road. 30-60 of the Pb deposited on the plants could be removed by washing. [See FSTA (1978) 10 10G607.] AJDW

## 78

**Chemical analysis and water pollution control in the Clyde catchment.**
Best, G. A.
*Proceedings of the Analytical Division of the Chemical Society* 15 (4) 119-120 (1978) [En] [Clyde River Purification Board, Rivers House, Murray Road, E. Kilbride, Glasgow G75 8LA, UK]

Within the framework of water pollution analysis, the concn. of pollutants in fish were studied. Regular analyses of flesh and livers show great variations in heavy metal and organochlorine concn. A disturbing aspect is the widespread contamination of fish by polychlorinated biphenyls (PCB), though the PCB levels in sewage sludge from 2 Glasgow sewage works fell from 2.3 to 1.5 mg/kg dried solids, and from 10.0 to 0.7 between 1971 and 1977. RM

## 79

**Heavy metal concentrations in Ontario fish.**
Brown, J. R.; Chow, L. Y.
*Bulletin of Environmental Contamination and Toxicology* 17 (2) 190-195 (1977) [5 ref. En] [Inst. for Environmental Studies & Fac. of Med., Univ. of Toronto, Toronto, Ontario M5S 1A4, Canada]

Concentrations of Cu, Cd, Pb, Zn and Hg were determined in 90 fish representing 15 spp. taken from Baie du Dore, Lake Huron, and Toronto Harbour, Lake Ontario. Samples were taken from muscle, liver and kidney, and analysed by AAS. Concn. of all metals were higher in fish from Toronto Harbour, which is more heavily polluted, and were similar in different spp. from the same locality. Mean concn. for Baie du Dore samples (p.p.m. wet wt.) were: Cd 0.06, Cu 0.45, Pb 0.19, Zn 4.69, and Hg 0.06; and for Toronto samples: Cd 0.13, Cu 1.93, Pb 1.78, Zn 36.02, and Hg 0.24. JRR

## 80

**The use of biological indicator organisms to monitor trace metal pollution in marine and estuarine environments - a review.** [Review]
Phillips, D. J. H.
*Environmental Pollution* 13 (4) 281-317 (1977) [189 ref. En] [Dep. of Zool., Uppsala, Sweden]

The use of indicator organisms to study trace metal pollution is reviewed, with particular reference to the use of macroalgae, bivalve molluscs and teleosts. It is suggested that macroalgae and bivalve molluscs (especially Mytilus edulis) are the most efficient and reliable indicators developed so far, but that the effects of sampling and environmental variables require further study before the results of surveys using biological indicator organisms can be relied upon. Tables show selected values from literature for the concn. of several trace metals in whole soft parts of bivalve molluscs (e.g. Mytilus edulis, Crassostrea spp., Ostrea spp., Pecten spp., Mercenaria mercenaria) and in fish muscle. AL

## 81

**The determination of trace metals in marine organisms by atomic absorption spectrometry.**
Ramelow, G.; Tugrul, S.; Özkan, M. A.; Tuncel, G.; Saydam, C.; Balkas, T. I.
*International Journal of Environmental Analytical Chemistry* 5 (2) 125-132 (1978) [21 ref. En] [Dep. of Marine Sci., Middle E. Tech. Univ., Ankara, Turkey]

The application of AAS to the analysis of trace metals in marine organismis is described. Samples (from the sea around Turkey) analysed were turbot, blue fish, white bream, sardine, gilt-head bream, grey mullet, swordfish, mackerel, mussel, shrimp, crab and oyster. Samples were digested with nitric acid. Hg was determined by cold-vapour method and Cd, Pb, Cu, Mn, Zn and Cr by flame atomization or flameless graphite-furnace atomization. Analytical results (1 or 2 samples) of Hg analysis (µg/g fresh wt.) were: turbot, 0.20; blue fish, 0.24 and 0.11; white bream, 1.12 and 1.70; sardine, 0.03 and 0.04; gilt-head bream, 0.30 and 0.29; grey mullet, 0.02; mackerel, 0.09; mussel, 0.03; and oyster, 0.16 (dry wt.). Analytical results of analysis of trace metals (µg/g fresh wt.) were for white bream, sardine, gilt-head bream, grey mullet, horse mackerel, stripped mullet, shrimp, crab (leg) and dried oyster (dry wt.) resp.: Cd, 0.04, 0.02, 0.03, 0.09, 0.17, 0.02, 0.02, 0.03 and 0.27; Pb, 0.61, 0.57, 0.68, 1.36, 1.05, 0.12, 0.34, 0.27 and 0.26; Cu, 1.11, 2.18, 1.20, 1.70, 0.99, 0.68, 1.77, 10.34 and 43.56; Mn, 0.51, 1.63, -, 0.33, 0.63, 0.22, 0.26, 0.29 and -; Zn, 10.6, 6.3, 9.5, 12.2, 4.3, 6.4, 9.3, 39.3 and 460.0; and Cr, 0.58, 0.28, 0.49, 0.10, 0.65, 0.14, 0.33, 0.36 and 3.68. SP

## 82

**Health laws and regulations - Malta.**
World Health Organization
***International Digest of Health Legislation*** 28 (4) 1022-1028 (1977) [En] [Geneva, Switzerland]

A selection of Maltese health laws and regulations is presented including the following which relates to food hygiene: The Pb in Cooking Utensils Regulations, 1976. L.N. 91 of 1976. These prescribe that no person may import or sell any cooking utensil intended for use in the cooking or other preparation of food intended for human consumption, if the utensil, when water is boiled therein, releases Pb into the water in excess of 0.05 mg/l. VJG

## 83

**[Hygienic evaluation of foods from the standpoint of their contamination with harmful metals. I. Pb, Cu, Zn, Sn, As and Fe.]**
Nikonorow, M.; Piekacz, H.
***Roczniki Panstwowego Zakladu Higieny*** 29 (2) 121-128 (1978) [available from 1st author Pl, ru, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku Pandstwowego Zakladu Higieny, Warsaw, Poland]

During 1974 and 1975 the contents of the title metals were determined in vegetable preserves, meat preserves, fish preserves, ice cream, tomato concentrates, tomato juices and various compotes (stewed fruit). Additionally, the contents of Pb and Cu in carbonated beverages during 1969-1975 and of all 6 metals in meat preserves after 1 and 2 yr storage were determined. Results are given in tabular or graph form. With regard to the carbonated beverages, the % of samples with Pb concn. greater than the permitted level ranged from 0.6% in 1975 to 5.0% in 1974; the corresponding range for Cu was from 1% in 1971 to 7.5% in 1974. All the other foods, with the exception of the vegetable preserves, showed for ≥ 1 metal concn. above the permitted level. The main sources of contamination with Pb, Cu, Zn and Sn were the metal packaging materials (cans) and the apparatus. HBr

## 84

**[Lead in canned products - connection and consequences.]**
Anon.
***NINF Informasjon*** No. 2, 25-29 (1978) [No]

A brief summary is given of the latest data on the source and importance of the Pb contents of canned foods. US work has shown that a 2 yr old child will take in an average of 98 µg/day with its food. 8-20% of this will emanate from canned products; of this 18-20%, 12% emanates from the solder, the remaining 6-8% from the product. Methods suggested for avoiding this migration are outlined briefly. It is pointed out that in Norway, many products are canned in Al and not in tin cans, thereby reducing the general migration level from 0.2 to 0.5 p.p.m. to 0.10-0.15 p.p.m. HBr

## 85

**[Release of toxicants from ceramic utensils.]**
Schadstoffabgabe keramischer Bedarfsgegenstände.
Herrmann, H.-J.
***Nahrung*** 22 (2) 199-203 (1978) [21 ref. De, en, ru] [VE Wissenschaftlich-Tech. Betrieb Keramik (WTK), Meissen, German Democratic Republic]

Aspects discussed include: the danger of leaching of Cd or Pb from the glaze or decoration on ceramic utensils; tolerances for max. permitted Cd and Pb release from ceramics in various countries; test methods with special reference to extraction with 4% acetic acid, either for 24 h at ambient temp. or for 30 min at 100°C; detn. of Cd and Pb in the extracts (by polarography, AAS or the dithizone method), and methods for minimization of the Pb and Cd release capacity of ceramic utensils. IN

## 86

**[Surveillance and evaluation of environmental chemicals with respect to uptake by man, using the heavy metals lead, cadmium and mercury as examples.]** Erfassung und Bewertung von Umweltchemikalien im Hinblick auf die Belastung des Menschen, dargestellt am Beispiel der Schwermetalle Blei, Cadmium und Quecksilber.
Lorenz, H.; Käferstein, F. K.
***Berichte über Landwirtschaft*** 55 (4) 772-778 (1977, publ. 1978) [26 ref. De, en, fr] [Zentrale Erfassungs- & Bewertungsstelle für Umweltchem. des Bundesgesundheitsamtes, Postfach, 1000 Berlin (West) 33]

The tasks of the Centre for Surveillance and Evaluation of Environmental Chemicals (ZEBS) of the Federal Health Office in the Federal Republic of Germany are briefly outlined. ZEBS acts as a coordinating centre for various research institutions and is at present collecting data for the preparation of a regulation covering levels of Pb, Cd and Hg in foods. As an example of the need for cooperation in research, the information available on Pb, Cd and Hg contents of mushrooms is briefly reviewed. DIH

## 87

**[Lead content of paper intended for direct contact with food products.]**
D'Arrigo, V.
***Industrie Alimentari*** 17 (6) 491-495 (1978) [11 ref. It] [Istituto di Merceologia, Univ. di Bologna, Bologna, Italy]

The Pb content of 40 samples of paper obtained from wholesalers in the Bologna region in March 1978, was determined by AAS. Concn. (µg/g) found were: imitation parchment paper (5 samples), 1.3-3.0 (mean, 1.96); vegetable parchment (7 samples), 0.8-9.6 (mean, 3.13); kraft (15 samples), 24.1-67.6 (mean, 41.96); food-grade board and liners (6 samples), 29.8-106.6 (mean, 52.8): the same 6 samples, but with the analysis restricted to the surface coming into contact with the food, 19.3-47.2 (mean, 35.42); and mixed-grade paper (7 samples) 11.5-115.6 (mean, 41.91). Data are also tabulated for the same groups of samples for Pb migration into acetic acid. The overall conclusions is that there is need for closer scrutiny of the quality of paper coming into direct contact with food.    HBr

## 88

**Direct analysis of lead in fruit juice by anodic stripping voltammetry with no prior sample preparation.**
Zink, E. W.; Matson, W. R.; Pfeiffer, S. L.; Pietrzyk, A. F.
***Journal of the Association of Official Analytical Chemists*** **61** (3) 653-659 (1978) [5 ref. En] [Environmental Sci. Associates. Inc., 45 Wiggins Avenue, Bedford, Massachusetts 01750, USA]

A method is presented for determining Pb in fruit juice in <3 min after instrument calibration. The range examined is 0.01-1.3 p.p.m. Pb. The method is compared with 3 other methods in general use. Standard errors of estimates between the methods compared range from 0.023 to 0.051 p.p.m. for a set of 50 samples and from 0.037 to 0.091 p.p.m. for a set of 9 samples. Regression correlation coeff. between methods range from 0.968 to 0.995. Judged by the comparisons, the direct method is precise and accurate over a >100-fold range of Pb concn.    AS

## 89

**[Content and distribution of heavy metals in cereals and cereal products.]** Gehalt und Verteilung von Schwermetallen in Getreide und Getreideprodukten. [Review]
Ocker, H.-D.
***Berichte über Landwirtschaft*** **55** (4) 796-808 (1977, publ. 1978) [51 ref. De, en, fr] [Inst. für Biochem. & Analytik, Bundesforschungsanstalt für Getreide- & Kartoffelverarbeitung, Schützenberg 12, 4930 Detmold, Federal Republic of Germany]

Hg, Cd and Pb contents of cereals and cereal products are reviewed. Data presented graphically or in tables give contents in wheat, corn, oats and barley, and flour and other milling products. In general contents are less than recommended safety levels (Hg 0.03 p.p.m.; Pb 0.5 p.p.m.; and Cd 0.1 p.p.m.), but about 5% of German wheat samples contain >0.1 p.p.m. Cd. A dry dehusking process can reduce Pb, Hg and Cd contents of wheat by 70%, 50% and 10-20%, resp. Milling by-products, especially wheat bran, concentrate Pb and Hg contamination, but milling does not greatly reduce Cd contamination. Baking of bread reduced Hg contents by 10-24%.    DIH

## 90

**Flameless atomic absorption spectroscopic determination of heavy metals in whole-fish samples.**
Okuno, I.; Whitehead, J. A.; White, R. E.
***Journal of the Association of Official Analytical Chemists*** **61** (3) 664-667 (1978) [14 ref. En] [US Fish & Wildlife Service, Denver Fed. Cent., Denver, Colorado 80225, USA]

Flameless AAS with a C rod atomizer was used to determine Pb, Cd and Cr in whole-fish samples. Samples were dry-ashed, and the metals were separated by solvent extraction with ammonium pyrrolidine dithiocarbamate in methyl isobutyl ketone, and then back-partitioned into an aqueous acid solution for analysis. The back-partitioning step allows a direct comparison of sample solutions with aqueous solutions of the standard. Recoveries of the metals from fortified samples averaged 91% (±9.6) for Pb and 100% (±5.6) for Cr at the 0.1-1 p.p.m. level, and 100% (±13.3) for Cd at the 0.01-0.1 p.p.m. level.    AS

## 91

**[Investigations into lead and cadmium contents in samples of meat and organs from poultry.]**
Untersuchungen auf den Gehalt an Blei und Cadmium in Fleisch-und Organproben von Geflügel einschliesslich Wassergeflügel.
Holm, J.
***Fleischwirtschaft*** **58** (2) 299-300; 242 (1978) [6 ref. De, en] [Staatliches Veterinäruntersuchungsamt, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

50-100 each of young chickens, broilers, boiling fowls, turkeys, ducks and geese were examined for Pb and Cd residues in meat and kidneys, and in some, also in liver. Samples were prepared by wet digestion with $HNO_3/HClO_3$ and analysed by AAS. Toxic metal contents of muscle were slightly high in turkeys, ducks and geese than in fowls. When classifying organs by their toxic metal contents, kidneys of 1.4% of broilers, 2.1% of boiling fowls, 4.9% of ducks, 0% of turkeys and 1.0% of geese contained >0.5 p.p.m. Pb (as did 5.0% of boiling fowl and 1.7% of goose livers), but Cd contents were much higher: in kidneys, 39% of boiling fowls, 69% of turkeys, 72% of ducks and 13% of geese exceeded 0.5 p.p.m., as well as 20% of boiling fowl and 17% of goose livers. If kidneys are discarded and livers separately evaluated, poultry meat is only very slightly contaminated. [See also FSTA (1976) **8** 11S1897 and (1977) **9** 6S978.]    RM

## 92

**Contaminating elements in mineral supplements and their potential toxicity: a review.**
Ammerman, C. B.; Miller, S. M.; Fick, K. R.; Hansard, S. L., II
***Journal of Animal Science*** **44** (3) 485-508 (1977) [249 ref. En] [Dep. of Anim. Sci., Univ. of Florida, Gainesville, Florida 32611, USA]

Information to help evaluate the potential injury to animals which may ingest Pb, Cd, Hg, As and V is presented, together with an estimation of the potential risk to consumers of edible animal products.    AL

## 93

**Atomic absorption spectroscopic determination of lead extracted from acid-solubilized tissues.**

Farris, F. F.; Poklis, A.; Griesmann, G. E.

***Journal of the Association of Official Analytical Chemists*** **61** (3) 660-663 (1978) [10 ref. En] [North Dakota State Univ., Coll. of Pharmacy, Fargo, N. Dakota 58102, USA]

A method is presented for determining Pb in a variety of animal tissues. Lyophilized samples are solubilized with $HNO_3$ at room temp. in glass screw-cap culture tubes. Following neutralization with NaOH and $NaHCO_3$, the Pb is extracted into methyl isobutyl ketone as the pyrrolidine dithiocarbamate complex and analysed by flame AAS. Brain, heart, liver, lung and spleen gave recoveries ranging from 92 to 102% with s.d. of <8%. Aorta, kidney, and rib were unsuitable for analysis by this method. A large number of samples can be analysed without specialized equipment or intricate experimental steps. The detection limit is 35 ng/g tissue (wet wt.) and sensitivity is approx. 140 ng/g tissue (wet wt.). AS

## 94

**[Processed foods. Determination of metallic contaminants. Determination of lead content.]**

Hungary, Magyar Szabvanyugyi Hivatal

***Hungarian Standard*** **MSZ 3612/3-77**, 4pp. (1977) [Hu]

## 95

**A routine screening method for toxic metals in foods.**

Allenby, P.; Robertson, J. W.; Shenton, F. C.

***Journal of the Association of Public Analysts*** **15** (2) 61-68 (1977) [17 ref. En] [N.E. Regional Analysts Dep., County Hall, Durham, UK]

A method for the estimation of Pb, Cu, Cd, Zn and As in foods in high and low concn. is described. The sample is partially digested with sulphuric acid and then dry ashed. The ash is dissolved in 3N hydrochloric acid and high levels of Pb, Cu, Cd and Zn are measured in this solution by flame AAS. As is measured in the acid solution by the Gutzeit method. When low levels of Pb, Cu, Cd or Zn are found, the acid solution is extracted with diethylammonium diethyldithio-carbamate in heptan-3-one before aspiration into the instrument. The effects of acidity, shaking time and standing on this extraction system have been investigated. High concn. of Ca and Fe have no important effect on the extraction procedure. A wide variety of foods has been analysed successfully. The s.d. is low. In a 20 g sample, 0.1 p.p.m. Pb, 0.1 p.p.m. Cu, 0.02 p.p.m. Cd and 0.05 p.p.m. Zn can be confidently determined. AS

## 96

**Isotope ratios as a tracer of environmental lead in children.**

Rowe, M. D.

***Dissertation Abstracts International, B*** **38** (4) 1635: Order No. 77-21208, 198pp. (1977) [En] [Univ. of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA]

To determine whether the ratio of the stable isotopes of Pb might be useful in tracing environmental Pb sources in children, total Pb concn. in various environmental samples were determined by AAS, the stable Pb isotope ratios were determined by MS, and a new statistical technique was developed for simultaneous estimation of isotope ratios and time trend parameters from non-linear MS signals. It was found that the isotope ratio was not satisfactory for the purpose; however, it could be used to determine the relative contribution of 2 known sources to the total Pb intake, e.g. food and atmospheric Pb. HBr

## 97

**[Use of chromium-plated lacquered tinplate for the manufacture of composite cans.]**

Morozova, E. V.; Sukacheva, T. A.; Feofanov, V. D.

***Molochnaya Promyshlennost'*** No. 4, 21-23 (1978) [6 ref. Ru] [Vses. Nauchno-issled. Inst. Molochnoi Promyshlennosti, Moscow, USSR]

The feasibility of using chromium-plated lacquered tin cans in the milk preserving industry was studied with cans whose cylindrical part was made from tinplate and top and base from chromium plated, lacquered tinplate. In tests during storage at 8 ± 2°C the following metal contents (mg/kg) were determined at 12 months in sweetened condensed milk in comparison to controls: Cr, 0.00 and 0.02; Pb, 4.7-6.9 and 5.3-6.6; Cu, 1.10-1.20 and 0.90-1.05; Fe, 8.8 and 9.6-11.0. The products in all experimental cans complied with the appropriate standard, and no changes were noted on the inner surfaces of top and base. Extended studies are at present being carried out on the use of these cans under production conditions. FL

## 98

**Simultaneous determination of copper, lead and zinc in wine by differential-pulse polarography.**

Bruno, P.; Caselli, M.; Fano, A. di; Fragale, C.

***Analyst*** **103** (1229) 868-871 (1978) [11 ref. En] [Istituto di Chimica Analitica dell'Univ., Via Amendola 173, 70126 Bari, Italy]

A simple and rapid differential-pulse polarographic technique is described for the simultaneous detn. of Cu, Pb and Zn in wine. 2 different procedures were used for calibration, i.e. calibration graphs and standard additions procedure. The latter was quicker but less accurate. AL

## 99

**Metal content of United Kingdom and overseas lager beers.**

Binns, F.; Ensor, R. J.; Macpherson, A. L.

*Journal of the Science of Food and Agriculture* 29 (1) 71-74 (1978) [13 ref. En] [Allied Breweries (Production) Ltd., Burton-on-Trent, Staffs., UK]

Contents of metals determined by AAS in lager beers are tabulated in detail by country of origin and original gravity band for samples from UK (25), E. Africa (37), Europe (44), Caribbean (19), S. America (8), N. America (5) and India (6). Mean values found (mg/l., ranges in parentheses) were: Na 58 (15-170), K 362 (253-680), Ca 46 (10-135), Mg 82 (34-162), Fe 0.12 (0.04-0.44), Cu 0.11 (0.01-0.41), Zn 0.06 (0.01-0.46), Pb all samples <0.06, and As all samples <0.02. DIH

## 100

**"First flush" water lead.**
Thomas, H. F.; Elwood, P. C.
***Lancet*** 2 (8080) 109-110 (1978) [3 ref. En] [MRC Epidemiology Unit (South Wales), 4 Richmond Road, Cardiff CF2 3AS, UK]

The 'decay curve' in the Pb concn. of water taken from the cold taps in the kitchens of 14 houses on an estate in North Wales, which had 4-6 m of external Pb service pipe and approx. 1 m of Pb pipe to the kitchen tap, was examined. An initial sample (1 l.) was taken, and the tap was then left running at a rate of 10-12 l./min and 30 ml samples were taken at 1, 2, 3, 4, 5 and 10 min. Water Pb concn. were determined by AAS. Results (mean) of detn. of Pb concn., for 0 (initial), 1, 2, 3, 4, 5 and 10 min flushing period resp., were: 370, 115, 108, 99, 86, 95 and 85 μg Pb/l. The data suggest that while all water Pb levels cannot be reduced by flushing to < 100 μg/l. (upper limit recommended by WHO), a short period of flushing is highly desirable; prolonged flushing achieves little but waste. SP

## 101

**Mineral concentrations in animal tissues: certain aspects of FDA's regulatory role.**
Mahaffey, K. R.
***Journal of Animal Science*** 44 (3) 509-515 (1977) [19 ref. En] [Div. of Nutr., Bureau of Foods, FDA, Washington, DC 20204, USA]

Current FDA regulatory programmes in toxic metals (Hg, Pb, Cd, Zn, As and Se) and detn. of max. tolerable levels in foods are discussed, as well as the regulation of metals intended as nutritional or veterinary feed supplements for animals in relation to the resultant metal content of edible animal tissues and products. AL

## 102

**[National Food Administration Ordinance on foreign substances in foods.]**
Sweden, Statens Livsmedelsverk
***Statens Livsmedelsverks Författningssamling*** SLV FS 1977:7, 6pp. (1977) [Sv] Box 622, S-751 26 Uppsala, Sweden

Aspects covered in this Ordinance, which came into force on 1 Jan. 1978, include: definition of terms; relation to other Swedish legislation for food hygiene; special extension of the tolerance for vinyl chloride (established in the Ordinance SLV 1974:17) up to 1 July 1978; tables of max. acceptable levels for numerous pesticides and their metabolites in fruit, potatoes and other vegetables; max. acceptable levels of sprouting inhibitors in potatoes; and max. permitted levels of aflatoxin, Pb and vinyl chloride in or on foods (with the exception of drinking water). AJDW

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# CONTENT AND ANALYSIS OF LEAD IN FOODS

SELECTED FROM VOLUME 11

FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

**under the direction of**

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

# INTRODUCTION

Food Annotated Bibliographies (FABs) are collections of abstracts on specific topics in food science and technology. The topics are chosen by the staff of the International Food Information Service as being of particular interest or importance. The topics normally interest individual workers, who may not require the full information provided in Food Science and Technology Abstracts, from which the abstracts for FABs are taken. The size and the cost of the FABs are controlled as much as possible with the interests of individual workers in mind.

Titles of the FABs now available are given on the back cover of this booklet. For up-to-date lists of FABs or suggestions for new topics please write to the address on the back cover. New subjects are searched for at least the five most recent volumes of Food Science and Technology Abstracts. Thereafter each FAB is updated monthly. Copies of each months abstracts on any topic may be obtained as indicated on the back cover of this publication. At the end of each volume of up-dating, the abstracts are merged and made available as a separate supplement to the original FAB.

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES
EDITOR

## 1

**[The 13th meeting of the Northern Section of the German Chemists Association, held in Oldenburg on 9 March 1978.]** 13. Sitzung des Arbeitskreises Nord am 9. März 1978 in Oldenburg. [Conference proceedings]
**Germany, Federal Republic of,** Gesellschaft Deutscher Chemiker Arbeitskreis Nord
*Lebensmittelchemie und Gerichtliche Chemie* 32 (4) 81-87 (1978) [De]

Summaries are given of papers presented at this meeting, including the following: Separation of the colorants E110 and E111 by high pressure liquid chromatography, by W. Frede (p. 83); Laboratory automation. Possibilities of data processing, by J. Smetenat (p. 84); and Problems of determination of Hg, Pb and Cd in fish, by R. Kruse (p. 86). 8 further papers are abstracted separately in FSTA, and are listed in the author index under **Germany, Federal Republic of,** Gesellschaft Deutscher Chemiker Arbeitskreis Nord [13th Symposium]. AJDW

## 2

**Food surveillance in the UK.**
Hubbard, A. W.
*Nutrition Reviews* 36 (7) 224-230 (1978) [10 ref. En] [Min. of Agric., Fisheries & Food, Great Westminster House, Horseferry Road, London SW1P 2AE, UK]

Monitoring of heavy metal content of foods in the UK is reviewed with particular reference to Pb and Cd. Tabulated data show mean levels and ranges of Pb and Cd contents found during recent surveys in cereals, meat and fish, fats, fruit, vegetables and milk. Pb contents in brassicae and root crops produced near a metal refining plant are tabulated and sources of Pb and Cd contamination of foods are discussed. DIH

## 3

**[Toxicological problems associated with packaging materials for foods.]**
Slorach, S. A.
*Näringsforskning* 22 (2) 121-125 (1978) [12 ref. Sv, en] [Statens Livsmedelsverk, Box 622, 751 26 Uppsala, Sweden]

Problems with contamination of foods with toxic substances originating in packaging materials are discussed, with reference to: Sn and Pb in canned foods; contamination of foods with Pb and Cd compounds used as colouring agents in plastics packaging materials; leaching of Pb and Cd out of enamelled utensils; and migration of monomers (acrylonitrile, styrene, vinyl chloride) out of plastics packaging materials. Toxicological aspects of these contaminants are discussed, together with the potential for elimination or minimization of the incidence and level of contamination of foods with constituents of packaging materials. AJDW

## 4

**[Simple and efficient methods for determination of biocides in foods.]** Einfache und leistungsfähige Methoden zur Bestimmung von Bioziden in Lebensmitteln. [Lecture]
Lohse, H.
*Lebensmittelchemie und Gerichtliche Chemie* 32 (4) 84-85 (1978) [3 ref. De] [Staatliche Chem. Untersuchungsanstalt, 2800 Bremen, Federal Republic of Germany]

A modification of Sperling's AAS method for detn. of heavy metals is described; a 10 mg homogenized sample of the material under test is wet-ashed at 90° C using 50 µl of a 1:4 mixture of $HNO_3$ and $HClO_4$; after dilution to 1000 µl, the heavy metals are determined by AAS (analytical conditions given). Tables of data are given for heavy metal concn. in samples of kale and mushrooms. Kale contained 2.0-34.4 mg Pb/kg and 0.16-0.80 mg Cd/kg; mushrooms contained 0.47-2.40 mg Pb/kg and 0.63-9.30 mg Cd/kg. The potential of gel permeation chromatography as a technique for preparation of samples for subsequent detn. of pesticides and plasticizers by high pressure liquid chromatography is discussed. [See FSTA (1979) 11 2A59.] AJDW

## 5

**[Aspects of medical interest concerning mushrooms.]** [Lecture]
Vigne, J.; Gounelle de Pontanel, H.
*Medecine et Nutrition* 14 (2) 131-135 (1978) [22 ref. Fr] [Cent. de Recherches Foch, 4 Rue de l'Observatoire, 75006 Paris, France]

Aspects considered include: the capacity of fungi to accumulate heavy metals from their substrate, with consequent relatively high heavy metal concn. in the edible parts; bacterial contamination; the risk of botulism from canned or bottled mushrooms; and the potential for growth of Clostridium botulinum in fresh mushrooms in gas-tight plastics packs. [See FSTA (1979) 11 2J266.] AJDW

## 6

**Determination of lead and cadmium in pasteurized liquid milk by flameless atomic absorption spectrophotometry.**
Koops, J.; Westerbeek, D.
*Netherlands Milk and Dairy Journal* 32 (2) 149-169 (1978) [146 ref. En, nl] [Netherlands Inst. for Dairy Res. (NIZO), Ede, Netherlands]

Small samples [approx. 2.4 ml] of milk are freeze-dried in specially designed teflon tubes and digested in the same tubes with $HNO_3$ for 3 h at 150° C after enclosure in stainless steel bombs. The digests are diluted with double distilled water and the Pb and Cd contents determined by the method of standard additions. A direct approach for Pb in diluted milk, omitting the preceding digestion step, is possible. Average values found for Pb and Cd in 12 samples of pasteurized milk, derived from various parts of the country, are 5 and 0.4 µg/kg resp. AS

## 7

**[Mercury, zinc, copper, lead and cadmium in herrings.]**
Vanderstappen, R.; Clerck, R. de; Vyncke, W.; Moermans, R.
*Revue de l'Agriculture* 31 (2) 331-336 (1978) [17 ref. Fr] [Inst. de Recherches chimiques, Museumlaan 51, B-1980 Terouren, Belgium]

The following results were obtained from metal detn. in herrings fished from the south part of the North Sea and the east part of the English Channel (mg/kg): Hg 0.04; Zn 6.6; Cu 0.48; and Pb 0.31; 72% of Cd detn. were below the limit of detection (0.01 mg/kg), and of the rest 0.01 mg/kg was found in 6 herrings, 0.02 in 4, 0.03 in 3, and 0.04 mg/kg in 1. Only Pb contents were significantly higher in fish from the Channel than from the North Sea (0.34 vs. 0.28 mg/kg). There was no significant correlation between wt. of the fish and heavy metals contents (except for negative correlation with Zn, r = -0.487), and none between the different metals. RM

## 8

**[Simplified digestion method and determination of lead, cadmium and arsenic in animal tissues by atomic absorption spectrometry.]** Vereinfachte Aufschlussmethode und Messtechnik zur Bestimmung von Blei, Cadmium und Arsen in tierischen Geweben mittels Atomabsorptionsspektrometrie.
Holm, J.
***Fleischwirtschaft*** 58 (5) 864-866; 745 (1978) [17 ref. De, en] [Staatliches Veterinäruntersuchungsamt, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

The previously developed method [FSTA (1976) 8 11S1897] is described with a view to its use for quick and accurate residue detn. for official meat examination. Pb, Cd and As concn. were determined in muscle, liver and kidney by wet digestion and AAS, and the method critically examined. Limits of detection for the 3 metals were 0.5-1.0 parts/billion; recovery rates were 87-107% for Pb (0.25-2.0 ng additions) in all tissues, 84-106% for Cd (0.05-0.4 ng) in all tissues, 82-92% for As (12.5-100.0 ng) in muscle and liver, and 75% for As in kidney. The low As recovery in kidney could be due to a matrix effect of the As-hydride system. Reproducibility was satisfactory. Optimum loading of the instrument and the quick digestion method allowed results to be obtained within 24 h. A disadvantage of the method is that it does not include Hg detn. RM

## 9

**[Lead, cadmium, copper and zinc contamination in and on spices.]** Schwermetallkontamination von Blei, Cadmium, Kupfer und Zink in und auf Gewürzen.
Gerhardt, U.; Muhr, G.
***Fleischwirtschaft*** 58 (5) 857-860, 863; 739 (1978) [21 ref. De, en] [Firma Gewürzmüller Karl Müller & Co., Postfach 30 04 80, 7000 Stuttgart 30, Federal Republic of Germany]

Inverse voltametry was used to determine the Pb, Cd, Cu and Zn contents of whole commercial spices and additives, their reduction after washing and increase during grinding (secondary contamination). Results were tabulated and compared with published values. The main advantage of inverse voltametry is its use of acetate buffer as basic electrolyte, allowing the simultaneous detn. of 4 elements from a digestion solution. Dry ashing causes losses, especially of Pb and Cd. The % s.d. for reproducibility of peak height was 3.1 for Pb, 14.6 for Cd, 7.2 for Zn and 1.5 for Cu. The amounts found were small and quantities absorbed from seasoned foods can be ignored (max. contents 0.70 p.p.m. Cd in black pepper, 4.10 p.p.m. Pb, 51.2 p.p.m. Zn and 16.7 p.p.m. Cu in paprika; 6.16 p.p.m. Pb in ground bay leaves, 1.36 p.p.m. Cd and 50.6 p.p.m. Zn in chopped parsley, 26.2 p.p.m. Cu in basil). Only 1 sample of ground bay leaves exceeded the 5 p.p.m. tolerance level. The Pb and Zn contents were greatly reduced by rinsing in water, but Cd and Cu concn. were scarcely affected. No secondary contamination was observed after mechanical grinding. RM

## 10

**[Trace elements in spices. I. The toxic elements lead, cadmium and mercury.]** Spurenelemente in Gewürzen. I. Die toxischen Elemente Blei, Cadmium und Quecksilber.
Hecht, H.
***Fleischwirtschaft*** 58 (5) 849-854; 745 (1978) [9 ref. De, en] [Bundesanstalt für Fleischforschung, 8650 Kulmbach, Federal Republic of Germany]

200 commercial samples of 36 herbs and spices were analysed for Pb, Cd and Hg by flameless ASS after wet digestion in a closed system. Results, shown in tables and histograms, showed great variations in concn. Generally the Cd and Pb concn. were much higher than those of meat and meat products, but possible health hazards must be judged in the light of the small amounts used. The leaf products were more heavily contaminated than fruit, flower, seed and rhizome products, e.g. marjoram contained max. concn. of 41.0 parts/billion (p.p.b.) Cd, 3.16 p.p.m. Pb, and 593 p.p.b. Hg and thyme contained 42.4 p.p.b. Cd, and 2.26 p.p.m. Pb. Other high Pb concn. were found in aniseed (2.91 p.p.m.) and paprika (1.08 p.p.m.). The mean concn. of Cd (p.p.b.), Pb (p.p.m.) and Hg (p.p.b.) for each group were: fruits, 18.2, 0.339, 39.4; flowers and seeds, 28.9, 0.193, 20.6; leaves, 30.4, 0.708, 98.2; and rhizomes, 10.1, 0.228, <0.536. The generally high contamination of marjoram may be important as this herb is added in appreciable amounts to some meat products. The available material did not provide clear evidence of secondary contamination during grinding, though some increase in Cd and Pb concn. was observed in pepper, nutmeg, pimento and cloves, and (possibly accidental) decrease in Pb concn. in cinnamon. Decorticating pepper did not significantly reduce contamination. RM

## 11

**Trace metals in food.**
Reilly, C.
***Food Manufacture*** 52 (1) 60-62, 77 (1977) [3 ref. En] [Dep. of Food Sci., Oxford Polytech., Oxford, UK]

The 3 major dangerous metal contaminants of foods, Hg, Cd and Pb, are discussed in terms of environmental sources and methods of excluding them from processed foods. Hg contamination can be avoided by proper control of raw materials and avoidance of gross metal contamination during production. Cd may be concentrated biologically, or may enter food from rust-proof platings, especially galvanized surfaces, as commercial zinc contains ≤1 % Cd. Pb is more abundant than Hg or Cd, and is accumulated in the body, thus making minimization of Pb contents in all parts of the diet a priority. Pb may enter food from solder on can seams and on repaired equipment, from enamels and glazes on pottery, from leaden pipework and tanks, and from paper and foil not designed for, but used for, wrapping food. Lead in Food Regulations restrict the level of Pb in most foods to $\leq 2$ mg/kg, but $\leq 0.5$ mg/kg in baby foods. Hg and Cd are not statutorily controlled; the WHO recommendations are 0.3 mg Hg and 0.4–0.5 mg Cd/wk. These levels are much greater than actual intakes in the UK. Other toxic metals, such as Zn and Cu, are also discussed briefly, and the problems of statutory limitations on trace elements are mentioned. JRR

### 12

**[Heavy metals in packaging materials for foods. Are coloured plastics packs necessary?]**
Andersson, E.; Engquist, A.; Frank, A.
***Svensk Veterinartidning*** 29 (21) 833–836 (1977) [8 ref. Sv, en] [Statens Vet. Med. Anstalt 104 05 Stockholm, Sweden]

Various plastics packaging materials were analysed for Pb and Cd by AAS. A red plastics lid of a marmalade jar contained 45 mg Cd; a yellow lid of a mustard jar contained 11.4 mg Cd. Cd and Pb were also detected in coloured plastics drinking straws, ketchup bottles, etc. Appreciable quantities of Pb and Cd were also detected on the exterior of printed plastics beakers, bags, and vacuum packs; however, little or no contamination of the packaged food was observed. Coloured plastics carrier bags had high Pb contents. Heavy metal content did not appear to be related to colour intensity. These results are discussed in relation to the potential health hazard from contact of foods with heavy metal-containing packaging materials, and contamination of the environment during disposal of such materials; it is suggested that use of heavy metal-containing pigments is unnecessary. AJDW

### 13

**[Tinplate and asparagus: results of an experiment.]**
Barbieri, G.; Rosso, S.; Milanese, G.
***Imballaggio*** 29 (264) 74–75 (1978) [5 ref. It] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

Asparagus was packaged in 4 different types of tin can at 2 different processors, and stored at ambient temp. for up to 24 months. The types of can used were: (i) cold tin, (ii) high tin fillet, and (iii) E4 and (iv) E6 electrolytic tin with 300 and 311 passivation, resp. The Pb, Sn and Fe contents of cans were sampled at 6 intervals during storage. Contents (p.p.m.) found in the asparagus in (i), (ii), (iii) and (iv) cans resp. after 1 and 24 months storage were: Pb, 0.15 and 0.26, 0.14 and 0.12, 0.14 and 0.15–0.16 (2 different processors), and 0.14–0.15 and 0.18–0.16 (2 different processors); Sn, 41.8 and 143.0, 10.0 and 106.0, 33.9–58.0 and 18.2–220.3, and 67.3–115.2 and 155.7–220.3; and Fe, 5.5 and 28.7, 10.7 and 12.8, 15.1–20.6 and 41.8–83.5, and 6.8–9.0 and 9.8–10.0. None of the cans showed any signs of corrosion. HBr

### 14

**[Determination of lead in glazed cooking earthenware by AAS.]**
Villanua, L.; Garcia Puertas, P.; Blanc, P.; Masoud, T. A.
***Anales de Bromatologia*** 30 (1) 21–40 (1978) [24 ref. Es, en] [Univ. Complutense, Madrid, Spain]

AAS was used to determine the release of Pb from glazed earthenware cooking utensils into 4% acetic acid at room temp. and on a water bath. Examination of 42 vessels confirmed the sensitivity of the method. 24 h at room temp. was sufficient to demonstrate the release of Pb from defective glazing; 18 of the samples exceeded the N. American tolerance limit of 7 p.p.m. under these conditions, and 26 exceeded the limit after subsequent heating for 1 h on a water bath with fresh acetic acid solution. All the samples released some Pb under either of the sets of conditions, so that none conformed to the Spanish Food Codex (2.04.03). RM

### 15

**The trace metal content of a representative Canadian diet in 1972.**
Kirkpatrick, D. C.; Coffin, D. E.
***Canadian Journal of Public Health*** 68 (2) 162–164 (1977) [6 ref. En, fr] [Food Res. Lab., Health Protection Branch, Dep. of Nat. Health & Welfare, Ottawa, Ontario, Canada K1A OL2]

Results are presented for the levels of Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni and Zn in a representative Canadian diet for 1972. The distribution of each of these trace metals between 12 food groups within the diet is presented and discussed in relation to their relative contribution and possible areas of accumulation. The average daily intakes of these trace metals in the diet are calculated. AS

### 16

**[The determination of microamounts of heavy metals in vegetable oils by differential pulse polarography.]**
Shinozuka, N.; Hayano, S.
***Journal of Japan Oil Chemists' Society [Yukagaku]*** 27 (5) 312–313 (1978) [6 ref. Ja, en] [Inst. of Ind. Sci., Univ. of Tokyo, Japan]

Pb and Cd in vegetable oils were determined by differential pulse polarography. The oils were dissolved in 1:1 (v/v) ethanol/benzene mixture containing 0.01-m LiCl. Peak currents of the metals added at p.p.m. levels were proportional to their concn. ($\leq 20$ p.p.m.) and were not affected by the nature of the anion. The method is fast and simple, but in some cases it may be necessary to destroy interfering peroxides. RM

### 17

**Trace metal content of a herring oil at various stages of pilot-plant refining and partial hydrogenation.**
Elson, C. M.; Ackman, R. G.
***Journal of the American Oil Chemists' Society*** 55 (8) 616–618 (1978) [18 ref. En] [Dep. of Chem., Saint Mary's Univ., Halifax, Nova Scotia, B3H 3C3, Canada]

Samples of a typical Atlantic herring oil at various stages of pilot-plant processing were analysed for Cd, Se, As, Hg, Cu, Pb and Zn. The Hg content of the crude oil was relatively low and was not greatly affected by processing. The Se level of 47 parts/billion in the crude oil was significantly lowered by hydrogenation and deodorization. As was removed by alkali refining. The Pb content was reduced by only 40% upon refining, probably because Pb was present as an organometallic material. The concn. of the other heavy elements was generally lowered during processing. AS

### 18

**[Animal experiments on the carry-over of toxic trace elements from feedingstuff into milk.]**
Tierexperimentelle Untersuchungen zum Carry-over toxischer Spurenstoffe aus Futtermitteln in die Milch.
Blüthgen, A.; Heeschen, W.; Kaiser, M.; Hamann, J.; Tolle, A.
***Kieler Milchwirtschaftliche Forschungsberichte*** 30 (2) 139-155 (1978) [32 ref. De, en, fr] [Inst. für Hygiene, Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

Max. intakes of Pb, Cd and Hg by dairy cattle consistent with maintaining levels in the milk below the tolerated limits (0.05, 0.01 and 0.02 mg/kg milk, resp.) proposed by WHO were investigated. The likelihood of these limits being exceeded in normal farm practice was examined. Pb and Cd were determined by atomic absorption spectrophotometry, and Hg by GLC. In 20-day experiments no dangerous carry-over of these toxic metals into the milk was found to follow feeding of Pb, Cd and Hg in amounts up to 100, 100 and 10 mg/kg fodder TS, resp. The Pb and Cd contents of typical farm-type rations fed averaged 2.67 and 0.168 mg/kg TS (in single cases $> 20.0$ and $> 1.0$), resp. Risks of the toxic metal content of milk exceeding WHO recommended limits under normal farming conditions are thus extremely slight. GTP

### 19

**[Heavy metal toxicity. A literature review.]** [Review]
Korkeala, H.; Mannonen, J.
***Suomen Eläinlääkärilehti*** 84 (1) 13-15, 18-25 (1978) [72 ref. Fi, en, sv] [Elainlääketieteellinen Korkeakoulu, Elintarvikehygienian Laitos ja Anatomian ja Embryologian Laitos, 00550 Helsinki 55, Finland]

The metals covered in this review are Hg, Pb and Cd. The digestive tract is the most common route of access to the organism, with the liver and kidneys forming the main targets. HBr

### 20

**[Vegetable oils and fats. Preparation of samples for determination of metals.]**
**Romania,** Institutul Roman de Standardizare
***Romanian Standard*** **STAS 145/23-77,** 2pp. (1977) [Ro] [Strada Roma 32-34, Bucharest, Romania]

A procedure is described for extraction of metals from vegetable oils by heating an emulsion of 100 g oil with 15 $cm^3$ HCl (a 3:2 aqueous dilution of HCl of sp. gr. 1.18-1.19) on a boiling water bath until the emulsion clears, and separation and filtration of the lower (aqueous) phase. The extraction is then repeated. The aqueous solution may then be used for detn. of Cu, Pb, Zn or Cd. [See also following abstr.] AJDW

### 21

**[Vegetable oils and fats. Determination of lead.]**
**Romania,** Institutul Roman de Standardizare
***Romanian Standard*** **STAS 145/25-77,** 7pp. (1977) [Ro] [Strada Roma 32-34, Bucharest, Romania]

A procedure for detn. of Pb in vegetable oils is described, based on reaction of Pb with dithizone at pH 10-11 to give a complex, soluble in organic solvents, which may be determined by colorimetry at 520 nm. Interfering substances may be eliminated by means of KCN. Sensitivity is 0.01 mg Pb/kg oil. [See also preceding abstr.] AJDW

### 22

**[Determination of trace heavy metals in environmental samples with special reference to lead in plants.]**
Yano, Y.; Odaka, N.; Takei, S.; Nagashima, K.
***Japan Analyst [Bunseki Kagaku]*** 27 (8, Tech. Report) T25-T30 (1978) [6 ref. Ja, en] [Univ. of Tsukuba, Ibaraki, Japan]

A method was devised for detn. of heavy metal traces in plant material and water by decomposition with $HNO_3$ and $HClO_3$, enrichment on a chelating resin column, and AAS. Small amounts of metals (e.g. 2 µg Pb) are quantitatively determined (95-104% recovery) from solutions containing large amounts of Ca, Mg, $SO_4^{2-}$, $PO_3^{3-}$ and $SiO_3^{2-}$. Analysis of green tea leaves revealed 4.2 ± 0.3 p.p.m. Pb, 6.8 ± 0.1 p.p.m. Cu and 14.3 ± 0.7 p.p.m. Zn. RM

### 23

**[Microdetermination of lead, cadmium, zinc and tin in biological materials by AAS after mineralization and extraction.]**
Boiteau, H. L.; Metayer, C.
***Analusis*** 6 (8) 350-358 (1978) [11 ref. Fr, en] [Lab. de Toxicol. et d'Hygiene Ind., 1 Rue Gaston-Veil, F-44035 Nantes Cedex, France]

After showing that separation of the elements improves detn. by flameless AAS, the authors describe 2 techniques for detn. of either Pb, Cd and Zn or Sn in any biological medium (blood, wine, food products of animal or vegetable origin). All the operations (mineralization and extraction) are performed in the same tube. The techniques are designed so as to reduce the risk of contamination and to allow detn. in series. Using 250 mg samples, limits of detection are 2 parts/billion for Cd, 40 parts/billion for Pb and Sn, 2 p.p.m. for Zn. The coeff. of reproducibility was $< \pm 10\%$. Mineralization and extraction had little effect on the accuracy of the results. RM

### 24

**Contributions to automated trace analysis. IV. Device for the automated simultaneous on-line determination of toxic trace metals in drinking water.**
Valenta, P.; Rützel, M.; Krumpen, P.; Salgert, K. H.; Klahre, P.
***Zeitschrift für Analytische Chemie*** 292 (2) 120-125 (1978) [16 ref. En, de] [Inst. of Chem., Nuclear Res. Cent. (KFA) PO Box 1913, Juelich, Federal Republic of Germany]

A reliable and robust automated device for simultaneous voltammetric analysis (by differential pulse anodic stripping voltammetry) of several of the most toxic trace metals (Cu, Pb, Cd, Zn) in drinking and ground water is described. It allows the required around-the-clock monitoring of drinking water in waterworks over long periods (several wk) with supervision. The device consists of adapted commercial polarographic instrumentation, a punched card programme controller and automatic sampling and standard addition facilities. Extended tests under realistic routine practical working conditions over several months established the suitability and potential of the concept and the satisfactory performance of the device. [See also Zeitschrift für Analytische Chemie (1976) 282, 369; and (1977) 285, 25.] AS

## 25

**Accumulation of arsenic, lead and other heavy elements in the iron-manganese oxide-hydroxide precipitation in the pipelines of city waterworks.**
Bacso, J.; Szalay, A.; Kiss, K.
***Science of the Total Environment*** 9 (3) 271–276 (1978) [3 ref. En] [Inst. of Nuclear Res. of the Hungarian Acad. of Sci., Debrecen, Hungary]

Iron-manganese oxide-hydroxide precipitates in the pipelines of waterworks of several Hungarian cities were analysed, and the accumulation of significant amounts of As, Pb, Cu and Zn was observed. The investigations demonstrated that the concn. of these trace elements in water is very small, but the high colloidal surface of the iron-manganese oxide-hydroxide precipitate lining pipes is highly enriched in these elements. Assay of these precipitates provides a very sensitive technique for monitoring water contamination. AS

## 26

**[Determination of low levels of Pb in drinking water.]**
Sirnik, V.; Golob, T.
***Zbornik Biotehniske Fakultete Univerze v Ljubljani*** **28**, 211–215 (1977) [4 ref. Sn, en] [Biotehniska Fak., Univ., Ljubljana, Yugoslavia]

Comparative studies were conducted on 3 methods for detn. of Pb in drinking water: (i) dithizone spectrophotometry, (ii) anodic stripping voltammetry and (iii) flameless AAS. Detection limits were (μg Pb/l.): (i) 3, (ii) 0.5 and (iii) 1. Results of analysis on 6 water samples gave the following results for (i), (ii) and (iii), resp. (μg Pb/l.); <3, <0.5 and <1; <3, 0.7 and <1; <3, 1.5 and 1.0; 6.6, 7.3 and 10.0; 11.8, 14.5 and 17.5; and 50.0, 51.5 and 56.5. Although (ii) has the lowest detection limit, (i) is recommended for routine use in normally-equipped laboratories, because of its simplicity and satisfactory results. [From En summ.] AJDW

## 27

**[Lead content of apples and pears.]**
Massi, C.; Spadoni, S.; Nurzia, N.; Gasperi, E.; Capazzi, S.
***Rassegna Chimica*** 30 (3) 151–159 (1978) [16 ref. It, en] [Ufficio d'Igiene e Sanita del Comune, Rome, Italy]

Pb contents were determined in apple and pear samples obtained from markets in many Italian towns, and from trees at various distances from motor traffic. Tabulated results illustrate great variations in Pb contents, both on the peel and in the pulp. The few available data suggested several sources of Pb contamination, i.e. the soil, atm pollution and fungicide treatment. Max. concn. of 3.70 p.p.m. on skin and 1.60 in pulp was found in a sample treated with $CuSO_4$ containing 6.4 p.p.m. Pb. Other results were: 0.20–1.00 p.p.m. on apple skin; 0.09–0.47 in pulp; 0.21–1.7 p.p.m. on pear skin; and 0.09–0.61 in pulp. Washing the fruit did not reduce Pb to low levels. It was suggested that fruit be peeled before eating. RM

## 28

**Plant-available lead and other metals in British garden soils.**
Davies, B. E.
***Science of the Total Environment*** 9 (3) 243–262 (1978) [23 ref. En] [Dep. of Geography, Univ. Coll. of Wales, Aberystwyth SY23 3DB, UK]

The chemical composition of British garden soils and its effect on the heavy metal composition of radish in urban, suburban and rural areas, and of potatoes in 2 villages, were studied. Results of detn. of Pb in soil and in radish show that as Pb levels in the soil increased (generally higher soil Pb levels were found in urban area and metal mining areas than suburban and rural areas) the contents of Pb in radish increased. However the min. to max. soil Pb ratio was 263.6 whereas the same ratio for radish (DM) was only 51.5, therefore the availability of Pb in soil is low. Results of Pb detn. in potatoes in the 2 villages showed that Pb levels were higher in potatoes grown in (i) the village where there were lead mines nearby and smelters operating in the last century than (ii) the village which was in general not polluted, with mean values of 2.72 and 1.34 μg Pb/g potato (DM) and 273 and 65 μg Pb/g soil, resp. The amount of Pb ingested by a typical person, wt. 75 kg, consuming 20 g (dry wt.) home grown potatoes daily was investigated. Results of analysis show that mean values for ingestion of 20 g potatoes/person daily in (i) gave the equivalent of 14.5% and (ii) gave 7.1% of WHO max. daily Pb intake. It was concluded that heavy metal contamination of garden soils is a special problem in industrial and urban areas but also occurs in rural areas. SP

## 29

**Variability in the concentration of 12 elements in corn grain.**
Pietz, R. I.; Peterson, J. R.; Lue-Hing, C.; Welch, L. F.
***Journal of Environmental Quality*** 7 (1) 106–110 (1978) [36 ref. En] [Res. & Dev. Lab., Canton, Illinois 60611, USA]

Corn grain (Zea mays L.) samples were collected from 9 University of Illinois Agronomy Research Fields situated throughout Illinois and from 6 soil associations in Fulton County. The 243 samples were obtained from sites receiving only inorganic fertilizers. The objective was to determine levels of selected elements in corn grain as it is commonly grown in Illinois. Chemical analysis of the corn grain for Ca, Fe, K, Mg, Mn, Na, Cd, Cr, Cu, Ni, Pb and Zn showed that concn. of K and Mg were highest, while levels of Cd, Cr and Pb were <0.2 μg/g. Variability of Na, Cd and Cr in the grain samples was high, while that of Mg, Zn and Mn was low. Element concn. in grain were within the ranges given in the literature. Concn. of Ca, Mg, Mn, K, Na, Cd, Cu, Cr, Ni, Pb and Zn from the 9 research fields varied significantly with location. Soil type at the 6 soil associations significantly affected the concn. of Mg, Mn, K, Cd and Cr in the grain. There was a highly significant positive correlation for applied fertilizer N and the grain Mn content for samples from the research fields. Highly significant negative correlations were observed for applied fertilizer N and the K, Na, Cd and Pb levels in corn grain. An evaluation of possible health effects for selected corn grain metals indicated that the background levels of Cd, Cr, Cu, Pb and Zn observed would not present any human or animal health problems. AS

### 30

**[Contamination by lead and cadmium during smoke drying of cereals.]** Untersuchungen zur Blei- und Cadmiumkontamination bei der Rauchgastrocknung von Getreide.

Woggon, H.; Malkus, Z.

***Nahrung*** **22** (7) 647–654 (1978) [6 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

Studies were conducted on effects of direct drying of oats, rye and wheat with combustion gases (using diesel oil as the fuel) on the Cd and Pb contents of the grain. 11 cereal samples were studied. Pb and Cd concn. were determined by direct inverse polarography, indirect inverse polarography (after dithizone extraction) or AAS; recovery data are given, and the relative merits of the analytical techniques are considered. Block diagrams are given showing Cd and Pb concn. before drying and after drying once or twice. The results show that direct drying using combustion gases generally had little effect on Cd or Hg concn. in grain. Cd concn. in all samples was well below the tolerance limit (0.10 mg/kg in the DM). 2 samples exceeded the tolerance limit for Pb (0.5 mg/kg in the DM); however, these samples had high Pb concn. before drying. It is concluded that this drying method gives little danger of contamination with heavy metals; however, there may be a risk of contamination with carcinogenic hydrocarbons. IN

### 31

**An improved ashing procedure for the determination of heavy metals in edible oils.**

Tsai, W.-C.; Lin, C.-P.; Shiau, L.-J.; Pan, S.-D.

***Journal of the American Oil Chemists' Society*** **55** (10) 695–698 (1978) [11 ref. En] [Food Ind. Res. & Development Inst., PO Box 246, Hsinchu, Taiwan, China]

An accurate, reliable, and simple method is described for the detn. of Pb, Cu, Cd, Mn, Zn, and Fe in edible oils by AAS following burning of the sample in a restricted air supply. Recoveries for the 6 heavy metals by the proposed methods were about 100%. The relative s.d. of the analysis for Pb at the level of 0.074 p.p.m. was 6%, and the Cu at the levels of 0.064 p.p.m. and 0.158 p.p.m. were 7% and 2%, resp. The recovery of Pb was found to be suppressed by the presence of a large quantity of Fe in the oil, but the suppression was alleviated by adding a $Mg(NO_3)_2$ solution to the charred residue before ashing. AS

### 32

**Accumulation and distribution of trace metals and radionuclides in marine organisms (particularly Tapes decussatus L.) in the Izmir Bay area, Turkey.**

(In 'Trace contaminants of agriculture, fisheries and food in developing countries' [see FSTA (1979) **11** 3C142].) [Lecture]

Geldiay, R.; Uysal, H.

pp. 81–85 (1976) [9 ref. En] [Ege Univ. Sci. Fac., Dep. of General Zoology & Marine Biol. Lab., Bornova-Izmir, Turkey]

The concn. of trace metals, Cu, Mn, Fe, Zn, Pb, Co, Cr, Hg, Cd, in the shellfish Tapes decussatus from polluted and non-polluted waters were studied. Results of analysis of concn. of heavy metals in T. decussatus (in non-polluted areas only) showed the following concn. (µg/g dry wt. basis), for muscle and soft body resp.: Cu, 1.74 and 9.82; Mn, 5.92 and 3.40; Zn, 59.18 and 94.17; Fe, 79.89 and 198.95; Cd, 4.19 and 5.98; Co, 4.61 and 6.19; Cr, 2.79 and 3.63; Pb, 10.62 and 2.65; and Hg, 3.04 and 2.47. Laboratory experiments with T. decussatus using $^{65}Zn$ and $^{115}Cd$ as tracers showed that accumulation and distribution in organs was similar to that found in samples from natural environmental conditions. SP

### 33

**[Standards (1976) for levels of arsenic, lead, cadmium and mercury in foods.]** Richtwerte '76 über Arsen-, Blei-, Cadmium- und Quecksilbergehalte in Lebensmitteln.

Anon.

***Bundesgesundheitsblatt*** **20** (5) 76 (1977) [De]

A table is given of standard max. levels of heavy metals in several foods, expressed as mg/kg fresh wt. Food groups covered include beef, pork and poultry meats, milk and milk products, vegetables, fruit, cereals, sugar, beer and vegetable oils. JRR

### 34

**New techniques for the digestion of biological materials – application to the determination of tin, iron and lead in canned foods.**

Williams, E. V.

***Journal of Food Technology*** **13** (5) 367–384 (1978) [18 ref. En] [Analytical Services, Tinplate Res. Dep., British Steel Corp. – Tinplate, Carmarthen Road, Swansea, W. Glamorgan SA5 8NH, UK]

A new technique for trace metal detn. suitable for a wide range of canned foods is described. Foods are digested under pressure in a disposable polystyrene container and resulting solutions are directly assayed by AAS or plasma emission techniques. 3 sets of $HNO_3$ digestion conditions are described which are suitable for Pb and Fe detn. in 3 respective food groups: non-fatty, non-alcoholic (fruit juices, vegetables, etc.); fatty, non-alcoholic (fish, milk, soup, cheese, etc.); and alcoholic (or containing dissolved gases; beer, wine, carbonated beverages, etc.). 3 sets of $HCl/H_2O_2$ digestion conditions are also described for Sn and Fe detn. in the 3 food groups. Full details of the methods are given; pressures obtained in the containers used are displayed graphically, and necessary safety precautions are described. The method was applied to a range of foods and was suitable for detn. of the elements studied in the concn. range 0.01–200 µg/ml. The new method and a classical wet oxidation/titration or colorimetry method were compared; means and ranges found (mg/kg) for the new and old methods, resp., were in orange juice, Sn 145 (143–150), 147 (142–157), Fe 4.48 (4–5.2), 5.00 (3.02–7.58); evaporated milk Sn 275 (265–285), 254 (238–270), Fe 3.0 (3.0–3.0), 3.4 (2.5–5.0); and ginger beer Sn 5.0 (5.0–5.0), 2.5 (2.5–2.5), Fe 7.1 (7.0–7.2), 5.88 (4.7–6.9). The new method is simple and cheap, can be easily automated and eliminates contamination from a number of sources. DIH

## 35

### Rapid screening field test for detecting cadmium and lead extracted from glazed ceramic dinnerware: collaborative study.

Krinitz, B.

*Journal of the Association of Official Analytical Chemists* 61 (5) 1124–1129 (1978) [9 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

A test intended for field screening glazed ceramic dinnerware for acid-extractable Cd and Pb was subjected to collaborative study. The test, a modification of the classical dithizone procedure, requires no instrumentation. 90 samples were field-tested for Pb and then analysed by the 24 h official method; of 63 negative field tests, 48 had no Pb after 24 h, and each of the other 15 contained $<0.7$ p.p.m. Of 60 samples field tested for Cd, 45 gave negative field tests; of these 30 showed no Cd by the 24 h test, and 15 showed $\leq 0.09$ p.p.m. All 15 laboratories participating in the study were able to detect a colour change at 0.05 µg Cd and 0.3 µg Pb/ml 4% acetic acid. The method has been adopted as interim official 1st action. AS

## 36

### [Influence of raw materials and the technological process on the lead content of multiple boards for type V foods.]

Arrigo, V. D'; Gregorio, C.

*Industrie Alimentari* 17 (7/8) 569–573 (1978) [2 ref. It] [Istituto di Merceologia, Univ., Bologna, Italy]

1 sample of 3-ply and 2 of 4-ply board of varying wt., moisture and ash contents were analysed by AAS for Pb contents at different stages of manufacture. Results (tabulated) showed that the total Pb content was related to the raw materials used (slurry composition), which in turn were governed by the degree of whiteness required in the end product. Extraction tests with 3% acetic acid showed that in all cases, Pb migration was greater from the top and bottom plies than from the central plies. HBr

## 37

### [Determination of some parameters in water. V. Lead; VI. Chromium; VII. Iron.]

Campione, S.

*Bollettino dei Chimici dei Laboratori Provinciali* 4 (6) 131–137; 138–144; 144–152 (1978) [18 ref. It, de, en, fr] [Lab. Chimico Provinciale di Bologna, Via B. Triachini 17, I-40138, Bologna, Italy]

The following methods for water analysis are described: (i) a very sensitive, accurate, colorimetric method for Pb detn., based on formation of colloidal PbS; the brown-black colour is proportional to the Pb concn. The reaction is quantitative and not subject to interference. Sensitivity is 0.05 p.p.m.; (ii) a fast, simple and sensitive colorimetric method for $Cr^{6+}$ and $Cr^{3+}$ detn., based on reaction in weakly acid solution of $Cr^{6+}$ with diphenyl carbazide. The intensity of the red-violet colour formed is directly proportional to the Cr concn. The reaction is quantitative and nearly specific. Interfering Mo, V, Fe and Cu may be removed by Cupferron, but are usually present at low concn. Interference by $NO^{-}_{3}$, free $Cl_2$ and organic compounds is eliminated by diluting the sample. The sensitivity of the method is $\geq 0.005$ ng Cr/l.; and (iii) a spectrophotometric method for total Fe detn. (soluble and in suspension), based on reaction of Fe with o-phenanthroline (1,10-phenanthroline). On boiling with HCl, ionic Fe is released, reduced from $Fe^{3+}$ to $Fe^{2+}$ with ascorbic acid and hydroxylamine-HCl and forms a pink-orange compond with O-phenanthroline. The sensitivity of the method is 0.1 mg/l. and accuracy ±4%. [See FSTA (1978) **10** 11H1364 for parts II, III & IV.] RM

## 38

### Lead content of wines determined by atomic absorption spectrophotometry using flameless atomization.

Edwards, M. A.; Amerine, M. A.

*American Journal of Enology and Viticulture* 28 (4) 239–240 (1977) [9 ref. En] [Matanzas Creek Winery, 6097 Bennett Valley Road, Santa Rosa, California 95404, USA]

110 Californian table wines, consisting of (i) 8 Cabernet Sauvignon wines bottled with Pb foil capsules, (ii) 18 wines made experimentally at the University of California, and (iii) 84 commercial samples were analysed for Pb contents. Commercial samples were higher in Pb than (ii), but there was apparently no relationship between Pb content and the use of Pb foil capsules. Mean Pb contents for each group (mg/l.) were: (i) 0.175, (ii) 0.063 and (iii) 0.125. These levels are considered not to pose a toxic hazard. JRR

## 39

### [Determination of Pb and Cd in mineral waters by anodic stripping voltammetry.]

Costantini, S.; Pepe, A.; Giordano, R.

*Rivista della Societa Italiana di Scienza dell'Alimentazione* 7 (3) 225–230 (1978) [6 ref. It] [Istituto Superiore di Sanita, Rome, Italy]

Pb and Cd were determined in 56 samples of mineral water (54 from Italy, 2 from France) by anodic stripping voltammetry using an ESA model 3010 automatic voltammeter. Operating conditions, electrode standardization, etc. are discussed. A table of results is given. Pb concn. ranged from 0.25 to 21.00 parts/billion (p.p.b.); Cd concn. ranged from not detectable to 23.0 p.p.b. This method gave a coeff. of variation of ±0.02 p.p.b. for a Pb concn. of 0.2 p.p.b., and a coeff. of variation of ±0.1 p.p.b. for a Cd concn. of 1 p.p.b. AJDW

## 40

**[Cd, Pb and Cu concentrations in meadow fungi.]**
Cadmium-, Blei- und Kupferkonzentrationen in Wiesenpilzen.
Schellmann, B.; Opitz, O.
***Lebensmittelchemie und Gerichtliche Chemie*** **32** (5) 97-98 (1978) [12 ref. De] [Inst. für Rechtsmed. Univ. Erlangen-Nürnberg, Universitätsstrasse 22, 8520 Erlangen, Federal Republic of Germany]

Cd, Pb and Cu were determined by polarography in 31 samples of (i) Psalliota campestris, 8 samples of (ii) Tricholoma saevum, and 5 samples of (iii) Boletus badius. Ranges of values for heavy metal concn. were, for (i), (ii) and (iii) resp. (mg/kg DM basis): Cd 0.2-2.2, 0.2-0.4 and 0.1-0.5; Pb 0.1-1.0, 0.1-0.4, and 0.3-0.5; and Cu 5.1-32.1, 9.8-21.7 and 4.9-29.0. These results are discussed in relation to literature data. It is concluded that the heavy metal concn. observed in (i), (ii) and (iii) present no health hazard. AJDW

## 41

**Lead in evaporated milk by anodic stripping voltammetry and atomic absorption spectrophotometry: cooperative interlaboratory study.**
Sulek, A. M.; Elkins, E. R.; Zink, E. W.
***Journal of the Association of Official Analytical Chemists*** **61** (4) 931-936 (1978) [En] [Nat. Food Processors Ass., 1133 20th Street NW, Washington, DC 20036, USA]

Results of a cooperative study on the detn. of Pb in evaporated milk, using a double blind referee technique, are reported. This study was designed to determine the normal variability of methods currently used for Pb analysis by canned food industry laboratories. 23 laboratories participated in the study. Each laboratory was instructed to use AAS (AOAC 25.065), anodic stripping voltammetry, or carbon rod AAS. Overall, the results appeared to be in close agreement with the spiking levels. Coeff. of variation for all laboratories was 36.0% at the 0.15 p.p.m. Pb level and 16.8% at the 0.40 p.p.m. Pb level. AS

## 42

**Passage of metals to freshwater fish from their food.**
Patrick, F. M.; Loutit, M. W.
***Water Research*** **12** (6) 395-398 (1978) [19 ref. En] [Microbiol. Dep., Otago Univ., Dunedin, New Zealand]

Tropical fish, Hyphessobrycon serpae, were fed tubificid worms containing high concn. of heavy metals, and tissue metal contents were determined. The worms were fed bacteria grown in a medium containing 1 mg/l. of each of Cr, Cu, Mn, Fe, Pb and Zn. Contents of these metals in tubificids fed to fish are tabulated, as are contents in commercial fish food and contents in fish (whole fish minus viscera) at day 0 and after 14 days of alternate feeding of fish food and tubificids. Contents of metals in young fish fed the high-metal worms, and those fed only fish food, were, resp., after 14 days (mg:kg dry wt.): Cr 5.91, 4.81; Cu 199.42, 106.46; Mn 19.99, 16.14; Fe 181.31, 120.19; Pb 36.28, 14.38; and Zn 499.2, 243.5. All differences are statistically significant (1.0%). DIH

## 43

**Concentration of cadmium, copper, lead, and zinc in six species of freshwater clams.**
Anderson, R. V.
***Bulletin of Environmental Contamination and Toxicology*** **18** (4) 492-496 (1977) [12 ref. En] [Dep. of Biol. Sci., N. Illinois Univ., DeKalb, Illinois 60115, USA]

6 spp. of clams (Lampsilis siliquoidea, Lampsilis ventricosa, Strophitis rugosus, Sphaerium, Anodonta marginata and Lasmigona complanata) were collected from the Fox River, Illinois and Wisconsin and the concn. of Cd, Cu, Pb and Zn in their shell and body was determined. There was considerable variability between the spp., but there were consistent trends in relationships between the metals. The order of metal concn. in the shells was Cd < Cu < Zn < Pb and for the body it was Cd < Cu < Pb < Zn. Metal concn. in the bodies of the freshwater clams studied generally reflected that found in the environment, with the exception of Zn. The shell had comparatively lower concn. of all metals. When the body was separated into general regions it was found that metal concn. were highest in the gills than muscle or viscera. VJG

## 44

**Trace metals in sea scallops, Placopecten magellanicus, from eastern United States.**
Greig, R. A.; Wenzloff, D. R.; MacKenzie, C. L., Jr.; Merrill, A. S.; Zdanowicz, V. S.
***Bulletin of Environmental Contamination and Toxicology*** **19** (3) 326-334 (1978) [9 ref. En] [Nat. Marine Fisheries Service, Northeast Fisheries Cent., Milford Lab., Milford, Connecticut 06460, USA]

A standard sea scallop dredge and bag was towed for 15 min at each of 42 stations along the middle Atlantic coast from eastern Long Island to Cape Hatteras, North Carolina. The catch from each tow was immediately processed into muscle, gonad and total visceral mass portions, for trace metal analysis. Tabulated data show the metal concn. (Ag, Cd, Cr, Cu, Hg, Ni, Pb and Zn) in the muscle, gonads and total visceral mass. Most metal concn., except Zn, in muscle tissue of the scallops were below detection limits of the methodology used. Zn levels range from about 2 to 8 p.p.m. In contrast to muscle, Ag, Cd, Cu and Zn were present in detectable concn. in gonads of scallops. Only Hg and Pb concn. were generally below detection limits for total visceral mass. Comparisons of the present data with those obtained on scallop muscle from the UK and New Zealand are shown. VJG

## 45

**Historical and current heavy metal residues in Hudson River fish.**
Rehwoldt, R. E.; Mastrianni, W.; Kelley, E.; Stall, J.
***Bulletin of Environmental Contamination and Toxicology*** **19** (3) 335-339 (1978) [9 ref. En] [Marist Res. Inst., Marist Coll., Poughkeepsie, New York, USA]

This investigation deals with fish taken from the Hudson River during 1976 and 1977 and museum samples from the same water system captured between 1934 and 1973. Tabulated data present the average values for Pb, Hg and Cd (mg/g dry wt.) for the following fish: alewife (Alosa pseudoharengus), Atlantic sturgeon (Acipenser oxyrhynchus), fundulus killifish (Fundulus diaphonus), small-mouth bass (Micropterus dolomieui), spot-tail shiner (Notropis hudsonius), striped bass (Morone saxatilis), sunfish (Lepomis gibbosus) and white perch (Morone americana). The results do not seem to follow any chronological relationship. The only apparent relationship that seems to exist is that between the feeding habits of the spp. and the residues. The predators are higher in Hg. Pb and Cd do not seem to be dependent upon feeding habits. VJG

## 46

**[Natural and other toxic materials in food.]**
Ammon, R.
*Elelmezesi Ipar* 32 (9) 328–335 (1978) [Hu, en, de, ru] [Univ. des Saarlandes Physiol.-Chem. Inst., 6650 Homburg, Federal Republic of Germany]

Aspects considered in this discussion of toxic materials in food include: pollen-derived toxic materials in honey; poisonous fungi; cyanides; tetrodotoxin in fugu fish; dinoflagellate toxins in shellfish; Clostridium botulinum toxin; staphylococcal toxin; mycotoxins; monoamine oxidase inhibitors and their interaction with dietary amines; allergens; F; As; Pb; Hg; Cd; DDT; and biphenyl. AJDW

## 47

**[Lead as environmental contaminant and its concentration in soils and plants.]**
Furlan, J.
*Zbornik Biotehniske Fakultete Univerze v Ljubljani* 26, 103–108 (1976) [12 ref. Sn, en] [Katedra za Tla in Prehrano Rastlin, Bioteh. Fak., Univ., Ljubljana, Yugoslavia]

Pb contents of maize gathered at the green plant stage at varying distances from a road of high traffic intensity (about 14 000 vehicles/day) ranged from about 70 mg/kg DM at 10-m distance to about 40 mg/kg DM at 30-m distance. Corresponding data for Pb contents of green lucerne gathered near a road of low traffic intensity (about 100 vehicles/day) were about 20–25 mg/kg DM at 20 m and about 18–20 mg/kg DM at 60 m. SKK

## 48

**Modified Fenton's reagent for the destruction of organic matter in the spectrophotometric determination of lead, cadmium and mercury in sodium carboxymethylcellulose.**
Cela Torrijos, R.; Perez-Bustamante, J. A.
*Analyst* 103 (1233) 1221–1226 (1978) [18 ref. En] [Dep. de Quimica Analitica, Univ. de Sevilla, Duque de Najera s/n, Cadiz, Spain]

The analytical control of trace amounts of metals in products that are used in the food industry is of great importance. A modification of Fenton's reagent was applied successfully to the rapid and safe mineralization of samples of ≤ 10 g of sodium carboxymethylcellulose in order to determine Pb, Cd and Hg by spectrophotometric methods based on the use of dithizone. Recoveries and reproducibility were satisfactory at the 0.05–1.5 p.p.m. levels. AS

## 49

**Consumption of canned fruits and vegetables related to the lead content.** (In 'Quelques problemes interessant les industries agricoles et alimentaires en zone mediterraneenne' [see FSTA (1979) 11 5G345].) [Lecture]
Gersons, L.
pp. 285–297 (Undated) [29 ref. En, de, fr] [Sprenger Inst., Wageningen, Netherlands]

The possible danger of intake of Pb from canned foods contaminated with Pb from the soldered seam is discussed, with reference to: literature data for Pb concn. in canned and bottled vegetables, baby foods, soups, jams and fruit juices; effects of lacquering on Pb uptake; changes in Pb concn. during storage; legislation concerning Pb in processed foods in various countries; Pb in samples of canned tomato puree from various countries; average weekly Pb intake and excretion by humans; and Pb accumulation. It is concluded that canned fruit and vegetable products are not a major health hazard in relation to Pb intake. AJDW

## 50

**Electrolytic determination of surface lead in empty metal containers.**
Estiandan, F. S.; Schafer, G. H.; Gedang, D. B.; Sakai, D. T.; Moffitt, R. A.
*Journal of the Association of Official Analytical Chemists* 61 (6) 1496–1498 (1978) [7 ref. En] [Carnation Res. Lab., 8015 Van Nuys Boulevard, Van Nuys, California 91412, USA]

The Pb content of empty metal containers (tin cans) can be determined by an electrolytic process using a constant voltage power supply and dilute acid electrolyte. The ionic Pb in the solution after electrolysis is determined by anodic stripping voltammetry. Electrolysis time is adjusted to give values that correlate with Pb contents of foods stored in cans for 6 months. The rapid Pb detn. can then be used for quality control purposes on production lines. DIH

## 51

**Determination of lead in fruit juices after concentration using immobilized ED3A.**
Guedes da Mota, M. M.; Griepink, B.
*Zeitschrift für Analytische Chemie* 291 (2) 128 (1978) [2 ref. En] [Univ., Croesestraat 77a, Utrecht, Netherlands]

The previously described method, viz. preconcn. on ED3A-CPG column and AAS [see FSTA (1977) 9 12A801 and FSTA (1978) 10 2H240], was applied to citric acid solutions (10 g/l.) resembling apple and orange juice. Recoveries of 60–150 μg added Pb/l. were 95% and 98%, resp. Comparable results were obtained with 2 samples of grape juice. Examination of the column for other heavy metals showed no Cd and Hg in the eluate, but 170 μg/l. Cu and 45 μg/l. Zn. RM

## 52

**[Lead, cadmium and mercury contents of edible fungi.]** Blei-, Cadmium- und Quecksilbergehalte in Speisepilzen. [Review]

Lorenz, H.; Kossen, M.-T.; Käfferstein, F. K.
***Bundesgesundheitsblatt*** 21 (13) 202–204 (1978) [22 ref. De, en] [Zentrale Erfassungs- & Bewertungsstelle für Umweltchemikalien des Bundesgesundheitsamtes, Postfach, 1000 Berlin 53]

Published data on the heavy metal contents (Pb, Cd and Hg) of edible fungi has been reviewed. A clearly elevated level of Hg exists in cultivated mushrooms (Agaricus bisporus), with a mean Hg content of 0.109 mg/kg fresh wt.; and in wild edible fungi (A. campester, A. arvensis, A. abruptibulbus, Cantharellus cibarius, and Boletus edulis) levels of Hg and Cd were considerably in excess of those of other vegetable foods (0.05–0.84 and 0.05–4.40 mg/kg fresh wt., resp.). It was concluded from model calculations of consumer exposure to these metals that a reduction in the consumption of edible fungi should be recommended. JRR

## 53

**Metals in grains sold under various labels – organic, natural, conventional.**
Chang, P.-T.; Salomon, M.
***Journal of Food Quality*** 1 (4) 373–377 (1978) [19 ref. En] [Dep. of Food Sci. & Tech. Nutr. & Dietetics, Univ. of Rhode Island, Kingston, Rhode Island 02881, USA]

The metal concn. of barley, brown rice, cornmeal, and lentils purchased at random in each of 2 yr in supermarkets and in health and natural food stores which served as outlets for foods advertised as organic or natural, was determined. Samples were ground to pass a 20 mesh screen and stored at 4° C in the dark. Cd, Cu, Fe, Pb and Zn were analysed using methods recommended by Anderson [Atomic Absorption Newsletter (1972) **11** (4), 88–90] and Giron [Atomic Absorption Newsletter (1973) **12** (1), 28–29]. The metal concn. for all grains analysed are tabulated. Little or no statistical significance was found in differences between the conventional, natural and organic grains, in most cases. There appeared to be more Zn and Pb in organic corn meal than the natural but more Cu in the natural. Average levels (range) of metals (μg/g) in grains were: Fe, 13–117; Zn, 12–42; Cu, 0.8–9; Pb 0.5–7, and Cd 0.09–0.4. Lentils were found to accumulate higher levels of metals than the cereal grains. SP

## 54

**Effects of some heavy metals on oats in pot experiments with three different soil types.**
Sorteberg, A.
***Journal of the Scientific Agricultural Society of Finland*** 50 (4) 317–334 (1978) [14 ref. En, fi] [Dep. of Soil Fertility & Management, Agric. Univ. of Norway, 1432 As-NLH, Norway]

An account is given of 2 pot experiments with oats, 1 of which (1973–1976) included all combinations of 5 heavy metals (Cd, Co, Pb, Hg and Ni), 3 rates of each metal (0, 50 and 250 mg/pot), 2 rates of lime and 3 types of soil. The other experiment (1974–1976) was similar but used only Cd and Hg at levels of 0, 0.5 and 5 mg/pot. Crop yields and heavy metals in the crops (grain and straw) were determined and soil analysis was performed; results are tabulated. Contents of Cd, Ni, Co and Hg in the grain were increased with the application of 250 mg/pot of these metals; application of even 0.5 mg Cd/pot resulted in a distinct increase in Cd content of grain. Hg at 0.5 and 5 mg only had a slight effect. The content of metals decreased throughout the experimental period, and the effect of Hg was minimal in the 4th year even at the highest application rate. Addition of Pb led to only moderate increases in Pb content of grain. Heavy liming tended to reduce the content of heavy metals (except Pb) in grain. AL

## 55

**[The content of heavy metals in marine organisms from the sea off North-West Africa.]** Zum Gehalt einiger Schwermetalle in marinen Organismen aus dem Auftriebsgebiet vor NW-Afrika.
Brügmann, L.
***Fischerei-Forschung*** 16 (2) 53–58 (1978) [48 ref. De] [Inst. für Meereskunde, Rostock-Warnemünde, German Democratic Republic]

Pb, Cd, Cu and Zn were determined by inverse voltammetry in samples of various marine organisms (including phytoplankton, zooplankton, and shrimps) from the Atlantic ocean off the NW coast of Africa. Tables of results are given. Heavy metal concn. in 2 samples of shrimps were (μg/g dry wt.): Zn 562 and 42; Cd 8.9 and 11.5; Pb 2.8 and 3.1; and Cu 41.2 and 12.7. Enrichment factors for heavy metals in shrimps were: Zn 5000; Cd 17 000; Pb 290; and Cu 1000. Literature data for heavy metal concn. in various types of fish and shellfish are also discussed. AJDW

## 56

**[Lead (Pb) and cadmium (Cd) contents in the meat and organs of slaughter cattle. I. Cattle from a relatively unpolluted region.]** Untersuchungen über den Blei(Pb)- und Cadmium-(Cd)-Gehalt in Fleisch und Organen von Schlachtrindern. I. Rinder aus einem wenig umweltbelasteten Gebiet.
Kreuzer, W.; Kracke, W.; Sansoni, B.; Wissmath, P.
***Fleischwirtschaft*** 58 (6) 1022–1030; 957 (1978) [63 ref. De, en] [Inst. für Hygiene & Tech. des Lebensmitteltierischen Ursprungs, Univ. München, Veterinärstrasse 13, 8000 Munich 22, Federal Republic of Germany]

Meat, liver and kidney samples from 299 head of beef of varying age, sex and feeding system, from a mainly agricultural pre-alpine region with little industry or traffic were analysed for Pb and Cd contents. Tabulated results showed the following median and mean values resp. (p.p.m. fresh wt. basis): Cd, meat <0.005 and <0.005, liver 0.050 and 0.061, kidney 0.230 and 0.341; corresponding values for Pb were <0.05 and <0.05, 0.14 and 0.15 and 0.31 and 0.35 resp. Ratios between concn. in the tissues were (median and mean resp.) Cd kidney:liver 4.6 and 5.1, liver:meat >10 and >12.2, and kidney:meat >46 and >62.8; corresponding values for Pb were, resp. 2.2 and 2.3, >2.8 and >3.0, >6.2 and >7.0. Great variations were observed in individual liver and kidney values around the median. Animals with high Pb or Cd levels in the kidneys also had high levels in the liver. Highly significant relations were observed between the age of the animals and kidney Cd contents and between Cd and Pb contents, in both kidneys and livers. No effect of sex, breed or feeding was observed.

The max. levels proposed in the 1st and 2nd draft 1976 regulations were exceeded in 17% (Cd) and 5.4% (Pb) of kidney samples, in <1% of liver samples and in no muscle sample. RM

## 57

**[National Food Administration Ordinance on foreign matter in foods.]**
**Sweden,** Statens Livsmedelsverk
***Statens Livsmedelsverks Författningssamling***
**SLV FS 1978:34** 12pp. (1978) [Sv]

This Ordinance, which came into force on 1 March 1979, specifies max. permitted levels for aflatoxins (0.005 mg/kg for all foods); Sn (150 mg/kg in grape or apple juice, 250 mg/kg in other foods); and vinyl chloride (0.01 mg/kg for all foods). Max. acceptable levels are specified for numerous pesticides and their metabolites in fruit, vegetables, and cereal products, for plant regulators in potatoes, and for Pb in a wide range of foods. AJDW

## 58

**Lead and cadmium in decorated glass tumblers. Availability of interagency task force report.**
**United States of America,** Food & Drug Administration
***Federal Register*** 43 (242, Dec. 15) 58633 (1978) [En] [Washington DC, USA]

To ensure that decorated glasses pose no significant risk due to Pb or Cd, the lip and rim area (i.e., top 20 mm) of the decorated glass must not leach >50 p.p.m. Pb or >3.5 p.p.m. Cd by a modification of the existing ceramic ware test procedure. A production lot is unacceptable if any unit in a randomly selected sample of 6 glasses exceeds the above levels. CAS

## 59

**Adventitious mineral elements in Hopi Indian diets.**
Kuhnlein, H. V.; Calloway, D. H.
***Journal of Food Science*** 44 (1) 282–285 (1979) [23 ref. En] [Dep. of Nutr. Sci., Univ. of California, Berkeley, California 94720, USA]

Both Sr and Pb are geologically present in the Hopi area, but only Sr accumulates in culturally important food plants in the agricultural setting. Pb from natural sources is present in traditional ceramics and culinary ash. In native maize corn foods, Fe content was elevated several-fold during home processing. The nutritional environment contains unconventional sources of Fe, Zn, Mn and other essential elements. IFT

## 60

**[Pb in foods for babies.]**
Arsac, F.; Boudene, C.
***Medecine et Nutrition*** 13 (1) 41–43 (1977) [15 ref. Fr, en]

Pb was determined by flameless AAS in 69 samples of commercial baby foods packaged in small jars; 5 samples of (i) soups and juices, 25 samples of (ii) fruit and vegetable products, 16 samples of (iii) meat and fish products and 23 samples of (iv) meat or fish based meals were studied. Mean values and ranges for Pb concn. were: (p.p.m.) (i) 0.06 and 0.03–0.10; (ii) 0.06 and 0.01–0.21; (iii) 0.03 and 0.01–0.04; and (iv) 0.03 and 0.01–0.06. It is concluded that these Pb concn. present no significant health hazard. AJDW

## 61

**A study of factors causing changes in the lead levels of crops growing beside roadways.**
McLean, R. O.; Shields, B.
***Environmental Pollution*** 14 (4) 267–273 (1977) [8 ref. En] [Biol. Dep., Paisley Coll. of Tech., High Street, Paisley, UK]

Four sites in central Scotland were selected for study of the effects of air-borne Pb contamination on the Pb content of (i) barley (Hordeum), (ii) potato (Solanum tuberosum) and (iii) oats (Avena sativa). All 3 were grown on strips 0, 20, 50 and 110 m from the edge of a motorway (15 000 vehicles/day), and (i) additionally against a main road (4000 vehicles/day). Samples were taken 5 times at 2-wk intervals, and Pb content was determined by AAS. Pb contents of (i), (ii) and (iii) are tabulated for each sampling period, site and distance from the road edge. Pb content decreased markedly with distance from the roadway. The largest fall occurred between 20 and 50 m; major atmospheric contamination was limited to a narrow zone bordering the road. There was no increase of Pb content in (i) grown against the low traffic density road. It was concluded that deposition on the leaf surface was the major factor. With oats and barley (dense ground cover) the Pb content rose to a max., then declined with withering and loss of the leaves. With potatoes (little initial ground cover) the Pb content increased with growth of the plant and the greater surface area of leaves. It would be preferable to avoid cultivation of crops very close to dense traffic roads if the leaves are used for human consumption. ELC

## 62

**The influence of sewage sludge on the content of heavy metals in potatoes and on tuber yield.**
Baerug, R.; Martinsen, J. H.
***Plant and Soil*** 47 (2) 407–418 (1977) [12 ref. En] [Dep. of Soil Fertility & Management, Agric. Univ. of Norway, 1432 A-NLH, Norway]

A small plot field experiment was carried out in which potatoes were fertilized with up to 80 t/ha of one of 2 sewage sludges, either rich or poor in heavy metals. Application of 40–80 t/ha of sludge DM, rich in heavy metals, increased considerably the concn. of Cu and Zn in the tubers, but the content of Hg, Ni and Pb was little influenced by sludge application. Generally, <0.5% of the heavy metals applied was accumulated in the tubers. The concn. of heavy metals in fresh tubers was in all cases below suggested max. tolerable values for food. JRR

## 63

**[Use of sewage sludge compost in mushroom cultivation, and influence of heavy metals on harvest quality.]** Untersuchungen zur Verwendung von Müllkomposten in der Champignonzucht und zum Einfluss von Schwermetallen auf die Qualität des

Erntegutes. [Lecture]
Grabbe, K.; Domsch, K. H.
*Mushroom Science* 9 (1) 209-220 (1976) [7 ref. De, en, fr] [Inst. für Bodenbiol., Forschungsanstalt für Landwirtschaft, Bundesallee 50, D-33 Braunschweig, Federal Republic of Germany]

Growth of mushrooms on composts manufactured from clarified sewage sludge, horse manure, or mixtures of the 2 was compared. Contents of Cu, Zn, Pb, Cd and Hg in the composts used are tabulated, as are accumulation factors in mushrooms for these metals in horse manure/sludge compost mixtures. Only those for Cu and Hg were > 1, being 1.4-1.7 and 6.5-9.0, resp. Levels of Zn in mushrooms were high for horse manure compost (190 p.p.m. in mushrooms); these levels were only increased by 20% by use of sludge compost having 4 × higher Zn contents. Highest contents of other metals observed in mushrooms were Pb 20 p.p.m., Cu 200 p.p.m., Cd 7 p.p.m., and Hg 9 p.p.m. Toxic levels were not encountered in any case, and metal levels did not inhibit mushroom growth. [See FSTA (1979) **11** 6J859.] DIH

## 64

**[On the contents of heavy metals in rice.]**
Myung Chan Kim; Ki Hwan Shim; Young Rae Ha
***Korean Journal of Food Science and Technology*** **10** (3) 299-305 (1978) [33 ref. Ko, en]

Cu, Pb, Zn, Ni, Hg, Cd, Cr and Mn contents of unhulled, brown, 70% polished and 90% polished rice of 2 var., Yusin and Milyang, grown in 4 cropping areas during 1976-1977 were analysed by AAS. Results of analysis showed that heavy metal contents decreased with an increase in milling degree, but significant differences in heavy metal contents were not observed between cropping areas or rice var. Ranges of heavy metal content (p.p.m.) of rice were: Cu, 0.80-2.89; Zn, 3.23-17.60; Mn, 6.72-70.25; Pb, not detected-0.64; Cr, not detected-23.20; and Ni, not detected-40.64. Hg and Cd were not detected in polished rice, and only traces were detected in some samples of unhulled rice. [From En summ.] SP

## 65

**Metal contaminants in milk and milk products.**
International Dairy Federation
***Bulletin, International Dairy Federation*** No. 105, 40pp. (1978) [186 ref. En] [41 Square Vergote, 1040 Brussels, Belgium]

The 7 chapters deal resp. with arsenic, Cd, Cu, Fe, Pb, Hg and Sn. Each chapter has a similar pattern, reviewing the metabolism, toxicology, legal limits, analytical methods, contents in milk and milk products, precautions necessary to reduce the content in milk and milk products, and graphical displays of contents and tolerances from up to 17 countries. JMD

## 66

**[Spectrographic method for determination of Pb and Sn in meat preserves.]**
Il'yashenko, L. A.
*Gigiena i Sanitariya* No. 12, 71-73 (1978) [2 ref. Ru] [Oblastnaya Sanepidstantsiya, Karaganda, USSR]

## 67

**[Ceramics, glass, vitreous enamelled items. Limiting values for extraction of hazardous constituents from food-contact items. Cold extraction.]** Keramik, Glas, Email. Grenzwerte für die Abgabe gesundheitlich bedenklicher Stoffe aus Bedarfsgegenständen. Kaltextraktion.
**Germany, Federal Republic of,** Deutscher Normenausschuss
***German Federal Republic Standard*** **DIN 51 032,** 3pp. (1977) [De]

Limiting values are specified for release of Pb and Cd from food-contact utensils, tested by the method specified in DIN 51 031, part I. Max. permissible values for ceramics, enamelled utensils and glass items with interior decoration are: shallow tableware, etc. Pb 1.0 and Cd 0.10 mg/dm$^2$; deep tableware etc. Pb 5.0 and Cd 0.50 mg/l.; shallow ceramics or glass cooking vessels Pb 5.0 and Cd 0.05 mg/dm$^2$; deep ceramics or glass cooking vessels Pb 2.5 and Cd 0.25 mg/l.; and deep packs or storage containers Pb 2.5 and Cd 0.25 mg/l. Max. values for glass items without interior decoration are: shallow crystal glass items Pb 0.5 and Cd 0.01 mg/dm$^2$; deep crystal glass items Pb 2.5 and Cd 0.05 mg/l.; shallow items made from other glasses Pb 0.1 and Cd 0.01 mg/dm$^2$; and deep items made from other glasses Pb 0.5 and Cd 0.05 mg/l. Max. values for drinking vessels with a decorated border are Pb 2.0 mg/item, and Cd 0.20 mg/item. For these limiting values, shallow items are defined as those with a depth ≤25 mm. AJDW

## 68

**[Surveillance of contamination of the food chain in France.]**
Pomarola, H.
***Medecine et Nutrition*** 12 (3) 169-178 (1976) [Fr, en] [Lab. du Min. de l'Agric., 25 Avenue de la Republique, 91305 Massy, France]

Surveillance of the food chain for contamination with radioelements, pathogenic microorganisms, parasites, pesticides and heavy metals in France is discussed, with reference to the legal situation, and activities of the Ministry of Agriculture. Control of use of food additives is also considered. AJDW

## 69

**[Pb in relation to canned foods.]** [Review]
Allouf, R.; Thomas, G.
***Medecine et Nutrition*** 12 (4) 255-258 (1976) [31 ref. Fr] [Carnaud S. A., 65 Avenue Edouard-Vaillant, BP 405-92103, Boulogne-sur-Seine, France]

Aspects covered in this review include: toxicological aspects (with reference to acceptable daily intakes of Pb by adults and by children and the cumulative nature of poisoning with Pb); sampling and analysis; sources of Pb in canned foods; legal aspects in France, Japan, Switzerland, the Federal Republic of Germany, the UK and the USA; and the contribution of canned foods to the daily intake of Pb. Experimental data are given for the concn. of Pb in samples of canned cassoulet, peaches, tomato concentrate, sardines in oil, green beans and orange juice, studied in June and Nov. 1975. The highest value recorded was 0.65 mg Pb/kg for sardines in oil. AJDW

## 70

**Metal contamination.**
Whitman, W. E.
***IFST Proceedings*** 11 (2) 86–90 (1978) [13 ref. En]

Pb, Hg, Cd, Be, Zn, Cu, Fe and Ni contamination and lack of Ca in foods are reviewed. SP

## 71

**Mercury, arsenic, lead, cadmium, and selenium residues in fish, 1971-73 - National Pesticide Monitoring Program.**
Walsh, D. F.; Berger, B. L.; Bean, J. R.
***Pesticides Monitoring Journal*** 11 (1) 5–34 (1977) [14 ref. En] [Fish & Wildlife Service, U.S. Dep. of Interior, 17 Executive Park Drive, N.E. Atlanta, Georgia 30329, USA]

As part of the National Pesticide Monitoring Program, the Fish and Wildlife Service analysed numerous selected fish samples (from river systems, coastal streams, Hudson Bay drainage, Great Lakes drainage, and interior basins) from 100 monitoring stations throughout the USA for residues of Hg, As, Pb, Cd and Se in 1971-1973. At most stations, detectable residues of all metals were present in > 95% of the composite samples. Fish with Hg residues > 0.5 mg/kg wet wt. in the whole fish were mainly predators. Fish with residues of As, Pb, Cd and Se of > 0.5 mg/kg included predatory and non-pre datory spp. Detailed results showing location, fish spp., size, number of fish and residues levels are given in tables for the 3 separate yr; only selected samples were analysed in 1973. Residues in the river fish analysed are based on wet wt. of the whole fish; the concn. in edible portions would probably be lower. AL

## 72

**[Metals in wines. Theory and experimental aspects of corrosion of metal equipment in winemaking plants.]**
Seppi, A.; Sperandio, A.
***Vini d'Italia*** 20 (112) 35–42 (1978) [2 ref. It, en] [Lab. Chimico Provinciale, Trento, Italy]

Theoretical aspects of corrosion of metals by wines are discussed. Practical trials were conducted in which batches of a tartaric acid/$SO_2$ model solution and wine were recirculated through winemaking equipment (pumps, filters etc.) made from stainless steel and/or bronze. Tables of data are given showing changes in pH, acidity and $SO_2$, Cu, Fe, Zn and Pb concn. in model solution and wines after recirculation through the equipment studied. The results show little uptake of heavy metals from stainless steel equipment, but considerable uptake from bronze equipment; rate of uptake of heavy metals was greatest at the start of the recirculation period. It is suggested that stainless steel equipment is preferable to bronze equipment for winemaking; that bronze equipment which has been out of use should be rinsed through with a solution of composition resembling wine before use; and that bronze equipment should be carefully cleaned to minimize surface corrosion while it is not in use. AJDW

## 73

**[Experimental studies of contamination of a food with lead, zinc and cadmium residues.]**
Experimentelle Untersuchungen über die Belastung eines Nahrungsmittels mit Rückständen von Blei, Zink, Cadmium.
Otto, K.; Jekat, F.
***Ernährungs-Umschau*** 24 (4) 107–109 (1977) [7 ref. De] [Fachbereich 19 - Ernährungswissenschaften, Univ., Giessen, Federal Republic of Germany]

40 samples of German and foreign honey obtained in 1975 from western Ruhr region markets were examined by AAS. Mean values with s.d. and ranges were: Zn, 11.1 ± 18.13 p.p.m. (0.64–62.66 p.p.m.); Pb, 0.149 ± 0.287 p.p.m. (0.024–1.667 p.p.m.); and Cd (37 samples), 11.79 ± 15.09 parts/billion (1.8–81.0 parts/billion). The findings are discussed from the public health viewpoint. SKK

## 74

**Mercury, cadmium, lead, and arsenic in sediments, plankton, and clams from Lake Washington and Sardis Reservoir, Mississippi, October 1975–May 1976.**
Price, R. E.; Knight, L. A., Jr.
***Pesticides Monitoring Journal*** 11 (4) 182–189 (1978) [26 ref. En] [Dep. of Biol., Univ. of Mississippi, University, Mississippi 38655, USA]

Mean concn. of Hg, Cd, Pb and As were highest in plankton, and levels were only slightly higher in clams than in sediments. Comparisons between clam size and trace metal concn. showed higher levels of Hg in the smaller clams. AL

## 75

**[Seasonal variation in heavy metal contents in fishery products from an area of the Adriatic Sea off the coast of Emilia-Romagna.]**
Viviani, R.; Cortesi, P.; Serrazanetti, G. P.; Poletti, R.
***Atti della Societa Italiana delle Scienze Veterinarie*** 30, 589–592 (1976) [9 ref. It, en, fr] [Istituto di Biochimica, Fac. di Med. Vet., Univ. di Bologna, Bologna, Italy]

A table of data is given for concn. of Hg, Pb, Cd, Cr, Mn and Ti in samples of clams (Venus gallina), cuttlefish (Sepia officinalis), shrimps (Squilla mantis), pilchards (Sardina pilchardus), anchovy (Engraulis encrasicholus) and sole (Solea solea) from the area specified in the title, studied over the period Dec. 1973–Oct. 1974. AJDW

## 76

**[Initial results of studies on the heavy metal content of mussels, mytilus galloprovincialis, from the east coast of Sicily.]**
Sarro, F.
***Atti della Societa Italiana delle Scienze Veterinarie*** 30, 595–597 (1976) [4 ref. It] [Istituto di Zootecnia Generale, Univ. di Catania, Catania, Italy]

Studies on the heavy metal contents in mussels from 3 sites on the east coast of Sicily are described; a table of results is given. Ranges of values (p.p.m. dry wt. basis) were: Cd 0.78–3.15; Mn 4.52–6.99; Cu 8.35–15.00; Mo

20.40–24.00; Co 3.75–4.46; Tl 1.60–2.09; Ni 37.33–40.16; Pb 0.5 (only 1 value given); Hg 0.001–0.003; and Zn approx. 100–250. AJDW

## 77

**[Effects of high Pb levels in the feed on the performance of and residue levels in broilers.]** Einfluss höherer Bleidosierungen im Broilerfutter auf Leistung und Rückstände.
Nezel, K.; Vogt, H.
***Archiv für Geflügelkunde*** 42 (6) 209–212 (1978) [6 ref. De, en, fr, ru] [Inst. für Kleintierzucht, Bundesforschungsanstalt für Landwirtschaft, Braunschweig-Völkenrode, Celle, Federal Republic of Germany]

671 one-day-old Lohmann broiler chicks were used in a 7-wk feeding trial to evaluate effects of diets with 0, 125, 250, 500, 1000, 2000 or 4000 p.p.m. Pb (as lead acetate) on performance, and on Pb concn. in the tissues. Tables and a graph of results are given. The results show tissue Pb concn. to increase with increasing dietary Pb concn. up to a saturation level, after which tissue Pb concn. did not increase with further increases in dietary Pb level. These saturation Pb levels were (p.p.m.) muscle 1; liver 6; kidney 12; bones >1000; skin 6; and fat 3. AJDW

## 78

**Hepatic and renal metallothionein concentrations in cows, swine, and chickens given cadmium and lead in feed.**
Verma, M. P.; Sharma, R. P.; Street, J. C.
***American Journal of Veterinary Research*** 39 (12) 1911–1915 (1978) [30 ref. En] [Dep. of Anim., Dairy & Vet. Sci., Utah State Univ., Logan, Utah 84322, USA]

This paper includes data for Cd concn. in the liver and kidney of cattle fed diets containing 0.18, 2.40 or 11.29 µg Cd/g for 12 wk, pigs fed diets with 0.23, 2.41 or 10.12 µg Cd/g for ≤24 wk, and laying hens fed diets containing 0.32, 1.88 or 13.06 µg Cd/g for ≤24 wk. Tissue Cd concn. in all 3 spp. increased with increasing dietary Cd level and treatment time. Max. values for Cd concn. in liver and kidney resp. were (µg Cd/g tissue, wet wt. basis): cows 3.21 and 8.83; pigs 10.29 and 42.26; and hens 26.27 and 165.67. Data are also given for metallothionein concn. in liver and kidney of cattle, pigs and hens fed diets with added Cd or Pb. AJDW

## 79

**[Lead and cadmium contents of some tissues in normally-fed fattening pigs.]** Blei- und Cadmiumgehalte in verschiedenen Geweben von Mastschweinen bei normaler Fütterung.
Vemmer, H.; Petersen, U.
***Landwirtschaftliche Forschung*** Sonderheft 34/I, 62–71 (1978) [8 ref. De, en, fr] [Inst. für Tierernährung, Forschungsanstalt für Landwirtschaft, D-3300 Braunschweig, Federal Republic of Germany]

A feeding trial was done with 100 pigs given different vegetable protein feeds containing 1.2 mg Pb and 0.2 mg Cd/kg air-dry matter. At 100 kg live wt. the pigs were slaughtered, and Pb and Cd contents resp. were determined; mean values were (mg/kg, fresh tissue): renal cortex 0.18 and 0.55; liver 0.13 and 0.085; muscle 0.17 and 0.0032; subcutaneous fat 0.021 and 0.001; and rib 0.35 and 0.026. Pb in DM of the various tissues was about half that in the rations, Cd in DM of the renal cortex about 11 times as high as that in the rations, in the liver about the same level as in the ration, and in muscle, ribs and subcutaneous fat considerably less than that in the ration (6, 17 and 0.5%, resp., of the level in the diet). RM

## 80

**Glazed ceramic ware: metal leaching.**
**Israel,** Standards Institution of Israel
***Israel Standard*** **SI 1003,** 4pp. (1978) [En]

This standard specifies the limits of leaching of Pb and Cd from glazed ceramic ware classified according to its intended use. Max. concn. of Pb and Cd (mg/l.), resp., in leaching liquid shall be: in tableware intended for foods and beverages, 3 and 0.3 (deep article), 5 and 0.5 (shallow article); similar tableware for use by children, 0.4 and 0.04; utensils intended for storage of foods and beverages, 0.4 and 0.04; cooking and baking ware, 3 and 0.3; and decorative ceramic ware which is not intended for use with food but can contain them, no requirements. Requirements for making the ware are given. Test methods for determining the concn. of Pb and Cd in leaching liquid are specified: leaching liquid to a level 5–7 mm below the upper edge of the article, and ambient temp. 22°C for 24 h; cooking and baking ware is heated to 120°C in an oil or sand bath, filled with boiling leaching liquid and heating continued for 2.4 h, then left at ambient temp. for 22 h before testing for Pb and Cd concn. AL

## 81

**[Heavy metals in the legislation of EEC countries – public health problems.]**
Billani, L.
***Atti della Societa Italiana delle Scienze Veterinarie*** 30, 145–147 (1976) [It]

## 82

**[Determination of trace elements in dietary fats and emulsifiers by means of flameless atomic absorption spectrometry. I. Determination of the ionically bound heavy metals copper, iron, nickel, zinc, lead and cadmium in dietary fats.]** Bestimmung von Spurenmetallen in Nahrungsfetten und Emulgatoren mittels flammenloser Atom-Absorptionsspektrometrie. I. Bestimmung der ionogen gebundenen Schwermetalle Kupfer, Eisen, Nickel, Blei und Cadmium in Nahrungsfetten.
Schütze, I.; Müller, W.
***Nahrung*** 22 (9) 777–788 (1978) [27 ref. De, en, ru] [Inst. für die Öl- & Margarineind., Magdeburg, German Democratic Republic]

Methods for detn. of trace elements in edible fats are discussed. A method for detn. of metals is described based on extraction of 100 g fat successively with 3 separate batches of 10 ml HCl, followed by a single extraction with double-distilled water. After phase-separation and filtration, the extracts are combined, and metals are determined by flameless AAS. Recoveries were: Fe 84–93%; Cu 91–106%; Ni 80–100%; Pb 80–

113%; Cd 91–115%; and Zn 70–94%. Mean relative error values were: Fe 2.9–17%; Cu 3.7–12.5%; Ni 0.7–17%; Cd 5.7%; and Zn 5.2%. Detection limits (mg/kg) were: Fe 0.02; Cu 0.005; Ni 0.01; Pb 0.01; Cd 0.0002; and Zn 0.001. The results agreed fairly well with those determined by the spectrophotometric method specified in German Democratic Republic standard TGL 21 466. A table of data is given for Cd, Zn and Pb concn. in olive oil, refined rapeseed, soybean, sunflower, cottonseed and palm oils, and hardened fish, rapeseed, palm-kernel and sunflower oils. Cd concn. ranged from $<0.0002$ to 0.019 mg/kg (the highest values being recorded for the refined oils); Zn concn. ranged from 0.02 to 0.28 mg/kg (the highest value being recorded for refined sunflower oil); and Pb concn. ranged from $<0.01$ to 0.02 mg/kg. The method is stated to be suitable for official checking of heavy metal concn. AJDW

## 83

**Evaluation of lead in raw and canned food.**
Sulek, A. M.
***Food Product Development*** 12 (6) 61–62 (1978) [En]
[Nat. Food Processors Ass., Washington, DC, USA]

In an attempt to evaluate the amount of Pb in raw and canned foods, surveys already carried out are discussed. These include the Can Manufacturers Institute and National Food Processors Association (CMI-NFPA) Surveys, comparing Pb levels in foods canned in 1976 with levels in foods packed in 1974, and the FDA's 1974 Heavy Metals Survey. Tabulated data present: Pb in raw products, selected examples from CMI-NFPA survey, 1976 (apple sauce, beets, sauerkraut, carrots, meats and spaghetti); and an estimate of dietary Pb from canned food (from the 3 surveys). VJG

## 84

**Pesticide residues in total diet samples. IX.**
Johnson, R. D.; Manske, D. D.
***Pesticides Monitoring Journal*** 9 (4) 157–169 (1976)
[19 ref. En] [Kansas City Field Office Lab., FDA, US Dep. of Health, Education & Welfare, Kansas City, Missouri 64106, USA]

During the 9th yr of the Total Diet Study, pesticide residues remained at the relatively low levels reported previously. 30 market baskets were collected in 30 cities which ranged in population from $<50\,000$ to $>1\,000\,000$. Averages and ranges of residues found are reported for the period Aug. 1972–July 1973 by food class. Pb, Se and Zn data are included for the first time. During this period, the individual items used in making up the dairy and meat composites in 4 market baskets were analysed for pesticides and the results are included. Results of recovery studies within various classes of residues are also presented. [See FSTA (1976) 8 10C498 for part VIII.] AS

## 85

**Pesticide and other chemical residues in total diet samples. X.**
Manske, D. D.; Johnson, R. D.
***Pesticides Monitoring Journal*** 10 (4) 134–148 (1977)
[19 ref. En] [Kansas City Field Office Lab., FDA, US Dep. of Health, Education & Welfare, Kansas City, Missouri 64106, USA]

360 composite food samples of 12 classes (dairy products; meat, fish and poultry; grain and cereal products; potatoes; leafy vegetables; legumes; root vegetables; garden fruits; fruits; oils, fats and shortening; sugar and adjuncts; and beverages) collected in 30 different grocery markets in 30 different cities during Aug. 1973–July 1974 were analysed for a total of 42 different toxic substances (organochlorine and organophosphorus pesticides, carbaryl, herbicides, certain heavy metals and polychlorinated biphenyls). Detailed tables of results are given, broken down by food class and residue type. Levels of pesticide residues in individual dairy products and meats in 4 market baskets are also tabulated. During this 10th yr of the Total Diet Study, 1613 residues of 42 different compounds were found in the 360 composites examined, compared with 1729 residues of 40 different compounds in the preceding period. [See preceding abstr. for part IX.] AL

## 86

**Pesticide and other chemical residues in total diet samples. XI.**
Johnson, R. D.; Manske, D. D.
***Pesticides Monitoring Journal*** 11 (3) 116–131 (1977)
[20 ref. En] [Kansas City Field Office Lab., FDA, US Dep. of Health, Education & Welfare, Kansas City, Missouri 64106, USA]

240 composite food samples of 12 food classes (dairy products; meat, fish and poultry; grain and cereal products; potatoes; leafy vegetables; legumes; root vegetables; garden fruits; fruits; oils, fats and shortening; sugars and adjuncts; and beverages) collected in 20 different market baskets of food from 20 different cities during Aug. 1974–July 1975 were analysed for a total of 42 different toxic substances (organochlorine and organophosphorus pesticides, carbaryl, herbicides, certain heavy metals and polychlorinated biphenyls). Detailed tables show the chemical residues found in food composites, occurrence frequency by food class, levels in the different food classes, as well as pesticide residues in individual dairy products and meats in 4 market basket samples. During this period of study 959 residues of 42 different compounds were found in 240 composites examined, compared with 1613 residues in 360 composites in the preceding period. [See preceding abstr. for part X.] AL

## 87

**[Lead in food of animal origin.]** [Review]
Bono, G. del; Rindi, S.
***Atti della Societa Italiana delle Scienze Veterinarie*** 30, 85–100 (1976) [128 ref. It] [Cattedra di Patologia Generale Comparata, Univ., Pisa, Italy]

The review covers the sources of Pb contamination, such as industrial activities, traffic fumes, horticultural sprays and lead shot from shooting. Contents of Pb found in meat and meat products, milk and milk products, fish, poultry and game are discussed; tables of data are not printed but are available from the author. JMD

## 88

**[Determination of lead in plastics packages for milk.]**
Libergott, E. K.; Roquette Pinto, C. L. S.;
Barreto, A. J. B.
***Informativo do INT [Instituto Nacional de Tecnologia]*** No. 15/16, 34–37 (1977) [7 ref. Pt, en]

Sachets are washed, mineralized in $HNO_3$ and ashed at 400–500°C. The Pb is extracted from a solution of the ash with dithizone in chloroform, and from the chloroform with $HNO_3$. The Pb is estimated at 510 nm as a complex in chloroform with isatin-2-(benzothiazolylhydrazone). Average values for 4 brands of sachets were 0.30–0.69 p.p.m., with an overall average for the 48 samples of 0.53 p.p.m. Pb. No Pb was found in the milk. JMD

## 89

**The determination of trace metals in mineral waters. I. Atomic absorption spectrometric determination of Cd, Co, Cr, Cu, Ni and Pb by electrothermal atomization after concentration by co-precipitation.**
Hudnik, V.; Gomiscek, S.; Gorenc, B.
***Analytica Chimica Acta*** 98 (1) 39–46 (1978) [14 ref. En]
[Inst. of Chem. Boris Kidric & Fac. of Natural Sci. & Tech., Univ. of Ljubljana, Ljubljana, Yugoslavia]

Procedures based on flameless AAS are described for the detn. of heavy metals in mineral waters. Because of matrix effects and the inadequate detection limits for direct detn., the metals are separated from the macrocomponents by precipitation of their tetramethylenedithiocarbamates with Fe(III) as collector, or by co-precipitation on $Fe(OH)_3$. Detection limits are 0.005, 0.3, 0.08, 0.10, 2 and 0.10 µg/l. for Cd, Co, Cr, Cu, Ni and Pb, resp., and are satisfactory for the detn. of these elements in mineral waters; precision is 2–7%. AS

## 90

**[Effects of clarified sludge fertilization on vegetable quality.]** Beeinflusst Düngung mit Klärschlamm die Qualität von Gemüse?
Maync, A.
***Industrielle Obst- und Gemüseverwertung*** 63 (5) 120–122 (1978) [17 ref. De] [Tech. Univ. München, Weihenstephan, Federal Republic of Germany]

Potential increase in trace metal residues in vegetables (e.g. Cd, Hg, Ni, Mn, Pb, Zn) following field spreading of clarified sludge is discussed with the aid of analytical data. To avoid metal accumulation in soil and crops, sludge should be cleaned prior to spreading. RM

## 91

**Pollution of mussels by particulate lead from sea water.**
Marletta, G. P.; Gabrielli, L. F.; Favretto, L.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 168 (3) 181–184 (1979) [12 ref. En, de]
[Istituto di Merceologia, Univ. di Trieste, I-34100 Trieste, Italy]

The accumulation of >0.8 µm sized, Pb-containing, suspended particles from polluted sea water in mussel (Mytilus galloprovincialis Lamarck) was studied. Pb was determined in the ash of the edible part of the mussel by a voltammetric macromethod. AAS was used for determining particulate Pb in sea water. The statistically significant linear regression, observed for Pb in mussel on Pb in sea water, indicates that a fraction of Pb found in the mollusc has a particulate origin, with an enrichment factor of about 2300. AS

## 92

**Trace metal concentrations in two shellfish species of commercial importance.**
Palmer, J. B.; Rand, G. M.
***Bulletin of Environmental Contamination and Toxicology*** 18 (4) 512–520 (1977) [19 ref. En] [Raytheon Co., Oceanographic & Environmental Services, P.O. Box 360, Portsmouth, Rhode Island 02871, USA]

(i) Sea scallop (Placopecten magellanicus) and (ii) ocean quahaug (Arctica islandica) were collected during 3 surveys (Sept.–Oct. 1974, April 1975, and July/Aug. 1975), placed in polyethylene bags and frozen. They were later shucked, thawed and pooled in the laboratory. All trace metal sample preparation except for Hg involved $H_2SO_4$-$HNO_3$ ashing followed by AAS or atomic emission spectrophotometry. For Hg, the above 2 reagents were used followed by potassium permanganate digestion with analysis by the cold vapour technique. Data are summarized in tables for mean ± standard error for (i) and (ii) resp. (p.p.m., wet wt.): Cd, 3.05 ± 0.85, 0.40 ± 0.08; Cr, 0.61 ± 0.17, 0.71 ± 0.21; Cu, 1.45 ± 0.19, 2.10 ± 0.34; Pb, 1.21 ± 0.17, 1.76 ± 0.17; Hg, 0.15 ± 0.03, 0.31 ± 0.11; Ni, 1.71 ± 0.25, 3.48 ± 0.49; and Zn, 15.89 ± 1.24, 14.88 ± 1.92. VJG

## 93

**Determination of tetraalkyllead compounds in water, sediment, and fish samples.**
Chau, Y. K.; Wong, P. T. S.; Bengert, G. A.; Kramar, O.
***Analytical Chemistry*** 51 (2) 186–188 (1979) [12 ref. En]
[Canada Cent. for Inland Waters, Burlington, Ontario L7R 4A6, Canada]

Tetraalkyl lead is probably the most toxic organolead compound found in water, sediment and fish. It remains unchanged in organisms for some time, with implications for the food chain. A gas chromatography AAS method previously reported [Analytica Chimica Acta (1976) 85, 421] has been further developed; this is specific for tetraalkyl lead, and other forms of inorganic or organic Pb do not interfere. Experiments were conducted with 5 pure alkyl compounds, $Me_4Pb$, $Et_4Pb$, $M_3EtPb$, $Me_2Et_2Pb$ and $MeEt_3Pb$. Solvent extraction was studied using 2 g fish homogenate spiked with 10 µg of each of the 5 compounds suspended in 5 ml aqueous EDTA solution. Of 7 solvents tested, hexane was clearly the most suitable and EDTA gave a good suspension with a clear aqueous/organic boundary after extraction. However, phase separation was avoided by the standard addition method of adding a known quantity (vol. <50 µl) to the hexane phase and measuring the increase in peak area. Recoveries are tabulated for each of the 5 compounds from 200 ml lake water, 5 g sediment and 2 g fish homogenate. Average recoveries (%) and detection limits resp. were: water 89 and 0.50 μg/l.; sediment 81–85 and 0.01 μg/g; and fish 74 and 0.025 μg/g. As alkyl compounds tend to be unstable in water, hexane should be added to the sample immediately after it has been taken. ELC

## 94

**[Physico-chemical analysis of drinking water. Determination of lead.]**
Czechoslovakia, Urad pro Normalizaci a Mereni
***Czechoslovak Standard*** **CSN 83 0520, Part 43,** 5pp. (1977) [Cs]

This standard stipulates conditions for detn. of Pb by photometry and AAS (both at concn. >0.01 mg/l.) [See preceding abstr. for part 42.] HBr

## 95

**[Total lead intake of adults and children.]** [Review]
Boon, J. H. den
***Voeding*** 40 (4) 154–156 (1979) [15 ref. Nl, en]

This review of the major sources of Pb intake by man (food, beverages, pottery, tobacco, exhaust gases) includes a table of mean Pb contents (in the Netherlands) of a wide range of food products. The overall conclusion is that persons, particularly smokers, living in towns with a high traffic flow may receive a Pb load above the FAO/WHO standard. HBr

## 96

**[Determination of Pb in lead pectinates.]**
Kaminskaya, F. I.; Litvina, T. M.
***Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya*** No. 5, 125–127 (1978) [8 ref. Ru] [Odesskii Tekh. Inst. Pishchevoi Promyshlennosti im. M. V. Lomonosova, Odessa, USSR]

The trilonometric method may be used for rapid detn. of Pb in its compounds with pectin. In the method, which is not laborious and gives satisfactory resolution, a vessel containing ammonia buffer, indicator, trilon B and the sample is heated to 60–70°C, excess trilon B being titrated with $MgSO_4$ solution. Pb at concn. of 0.02–0.2 mg/ml solution may be determined. The method may be used to evaluate pectin complex-forming ability with Pb ions. STI

## 97

**Lead content of vegetables, millet, and apple trees grown on soils amended with colored newsprint.**
Elfving, D. C.; Bache, C. A.; Lisk, D. J.
***Journal of Agricultural and Food Chemistry*** 27 (1) 138–140 (1979) [16 ref. En] [Dep. of Pomology, Pesticide Residue Lab., New York State Coll. of Agric., Cornell Univ., Ithaca, New York 14853, USA]

Beans, cabbages, carrots, millet, onions, potatoes, tomatoes and apple trees were grown on Mardin silt loam pH 5.6 or Teel silt loam pH 7.2. The soils were amended by incorporation of 10% (w/w) of un-inked bond paper (controls) or 10% (w/w) of printed coloured paper. The same soils were used for 2 yr in succession. The unamended soils contained 13.5–15.0 p.p.m. Pb, the coloured paper contained 567 p.p.m. Pb. Pb contents in edible parts of plants produced (except apples, leaves and twigs only) are tabulated for the 2 yr. No consistent effect of soil pH on Pb uptake was observed; highest Pb levels in edible parts were in millet seed from millet grown on pH 5.6 soil, 2.20 and 3.13 p.p.m. dry wt. for control and coloured paper-amended soil, resp. Not all crops showed increased Pb contents with soils amended with coloured paper. DIH

## 98

**[Deposition of lead on fruit and vegetables exposed to motor vehicle emissions.]** Untersuchungen zur verkehrsbedingten Bleibelastung von Gemüse und Obst.
Flam, A.; Hofstetter, A.
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** 69 (4) 505–515 (1978) [3 ref. De, fr, en] [Chem. Lab. der Stadt Zürich, Ausstellungsstrasse 90, CH-8031 Zürich, Switzerland]

87 samples of fruit and vegetables were exposed to the air for 9 h at locations in busy streets and squares in Zürich. Tabulated data show Pb contents before and after exposure, and the significance of any increase. Pb contents increased 30–100% of original level in 27 samples (31%), 0–30% in 52 samples and decreased in 8 samples. Washing experiments on 26 samples of fruit and vegetables showed that in most cases more Pb was removed by washing than had been deposited during exposure, and in the remaining samples ≥50% of the deposited Pb was removed. DIH

## 99

**Sewage sludge as a soil amendment, with special reference to Cd, Cu, Mn, Ni, Pb and Zn – comparison of results from experiments conducted inside and outside a glasshouse.**
Vries, M. P. C. de; Tiller, K. G.
***Environmental Pollution*** 16 (3) 231–240 (1978) [12 ref. En] [CSIRO, Glen Osmond, S. Australia 5064, Australia]

Lettuces and onions were grown in pots (16 kg dry soil) in a glasshouse, in mini-plots, 1 m × 1 m, outside that glasshouse and in a market garden on the same soil amended with 0, 1, 3 and 9 t $ha^{-1}$ dried sewage sludge from a treatment plant serving a semi-industrial part of Adelaide, S. Australia. Edible parts of lettuce tops and onion bulbs were analysed for Cd, Cu, Mn, Ni, Pb and Zn. The sludge applications brought about a sharp increase of the metals, except Pb, in the plant material from the glasshouse, whereas there was generally little increase in the concn. in the field plants. Results of the mini-plots were in line with those of the field. The experiment has shown that glasshouse experiments can give completely erroneous indications of the probable uptake of heavy metals by vegetables on sludge-treated soils under field conditions. Differences are attributed to variations in soil and air temp. and humidity, soil moisture and light intensity; growth rates were faster in the glasshouse. Some of the implications of the uses of sewage sludge on farmland and in commercial glasshouses are discussed. AS

### 100

**[Heavy metals in some vegetables.]** Schwermetalle in einigen Gemüsearten.
Fritz, P. D.; Foroughi, M.; Ventner, F.
***Landwirtschaftliche Forschung*** Sonderheft 33/II, 335–343 (1977) [49 ref. De, en, fr] [Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

To estimate possible accumulation of heavy metals in solids and crops, the metal content was determined in crops grown on soil which had not yet been fertilized with sewage sludge. Mixed samples of 10 leaf, fruit and root vegetable species grown on soils untreated by sewage sludge or sludge compost were analysed for Cu, Zn, Pb, Cr, Cd and Ni content. Tabulated results showed metal contents in the edible portion in the sequence Zn > Pb > Cu > Ni > Cr > Cd. The highest concn. were found in the leaves (spinach, celery leaf, lettuce, cabbage), and the lowest in fruits (beans, cucumber, tomatoes). The range of concn. were (p.p.m. on DM): Cu, 2–78 (celery leaf); Zn, 15–300 (spinach); Pb, 0–62 (radish); Cr, traces–14 (lettuce); Cd, not detected–4 (spinach); and Ni, not detected–18.5 (lettuce). RM

### 101

**[Metal content of wheat grown in the Milan district.]**
Farini, A.; Genevini, P. L.; Vigano, P.
***Tecnica Molitoria*** 30 (3) 153–159 (1979) [12 ref. It, en] [Istituto di Chimica Agraria, Univ. degli Studi di Milano, Milan, Italy],

164 samples of wheat grain from 80 locations in the Milan district were analysed for Cu, Pb, Cr, Zn, Ni and Cd by AAS. Max. values recorded (mg/kg DM) were Pb 10.35, Cr 0.33, Cu 22.44, Zn 105.80, Ni 1.53, and Cd 0.54. Block diagrams are given showing variation in the concn. of these metals in the wheat samples studied. The results are discussed in relation to literature data, and the significance of industrial pollution, motor vehicle exhausts, etc. as sources of heavy metal contamination. AJDW

### 102

**[Chemical residues in milk. Development of contamination.]**
Mouillet, L.; Luquet, F. M.; Mahieu, H.
***Alimentation et la Vie*** 66 (2) 108–118 (1978) [8 ref. Fr] [Labcodral, 105 Rue de Universite, 59509 Douai, France]

The organochlorine pesticide and metal contamination of milk in France was studied between 1970 and 1976. Results, shown graphically and in tables, suggest progressive reduction in organochlorine residues, with fairly low levels from 1974 onwards. Heptachlor residues are falling from the excessive levels of the early 1970s to <100 μg/kg, dieldrin and lindane are tending to stabilize at 50 and 100 μg/kg, resp., and (α + β)-BHC is generally <100 μg/kg fat. Appreciable rises in Cu and Fe concn. takes place during processing of milk. Other metals (Mn, As, Cd, Hg, Pb) and F are present at low levels. RM

### 103

**[Content of heavy metals (Cd, Cu, Hg, Ni, Pb, Zn) in sea trout from the Göttingen area of the river Leine.]** Gehalt an Schwermetallen (Cd, Cu, Hg, Ni, Pb, Zn) in Bachforellen im Leine-Raum Göttingen.
Abo-Rady, M. D. K.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 168 (4) 259–263 (1979) [22 ref. De, en] [Inst. für Physische Geographie, Senckenberganlage 36, D-6000 Frankfurt/M., Federal Republic of Germany]

Sea trout (3–4 yr old) were sampled from the river Leine up- and downstream of the town of Göttingen. Mean contents of the title metals (determined by AAS) are tabulated for muscle, liver and whole fish for the 2 sampling points. Of contents in muscle, only Cd level was significantly higher (at 5% level) in downstream than upstream samples, 0.016 ± 0.003 vs. 0.011 ± 0.001 μg/g fresh wt. Levels in liver were significantly higher in downstream than upstream samples for Cd, Hg and Zn. Liver Ni contents were higher upstream than downstream; this is traced to pollution originating further upstream of Göttingen. Contents of all metals in muscle were lower than suggested max. allowable contents. DIH

### 104

**Bioaccumulation of lead in Atlantic salmon (Salmo salar).**
Ray, S.
***Bulletin of Environmental Contamination and Toxicology*** 19 (5) 631–636 (1978) [13 ref. En] [Dep. of Environment, Fisheries & Marine Service, Resource Branch, Bedford Inst. of Oceanography, Dartmouth, Nova Scotia, B2Y 4A2, Canada]

Salmon grilse (1 sea yr) and parr from the Miramichi River, New Brunswick were caught, put in plastics bags, frozen transported to the laboratory for storage and individually thawed before dissection. The Pb content of the muscle, gill, liver, kidney and spine was determined by flameless AAS. The data are tabulated for 10 samples of each type. The relative s.d. for the fish samples is large and reflects variations from fish to fish. The relative Pb levels in all parr tissue samples are much higher than the grilse. Range of concn. of Pb (μg/g dry wt.) in grilse and parr resp. is: muscle, 0.028–0.172, 0.77–2.29; gill, 1.99–7.57, 6.65–20.65; liver, 1.59–11.20, 16.45–132.59; kidney, 11.39–51.15, 21.19–173.47; and spine, 0.44–1.20, 4.09–13.10. VJG

### 105

**Patterns of trace metal accumulation in crayfish populations.**
Anderson, R. V.; Brower, J. E.
***Bulletin of Environmental Contamination and Toxicology*** 20 (1) 120–127 (1978) [21 ref. En] [Dep. of Biol. Sci., N. Illinois Univ., Dekalb, Illinois, USA]

Concn. of Cd, Cu, Pb and Zn were investigated in 3 populations of crayfish, Oronectes virilis (Hagen), 2 collected at the same location (pool and river at Elgin) but at sampling sites with different inputs of trace metals, and the third from a site on the same river at Algonquin where metal input was low. Crayfish samples were separated by sex and 4 size groups. Some of the larger specimens were dissected to obtain gills, muscle, viscera and exoskeleton for body part analysis. The general relationship between metal concn. at the sites was $Cd < Pb < Cu \leq Zn$. Differences between the metal concn. at the sites were significant at the 0.01 level. Significantly higher concn. of Cd and Pb were found in crayfish taken from the river at Elgin compared to those collected in the pool at Elgin or the river at Algonquin. There were no significant differences in concn. of Cu or Zn between any of the 3 populations of crayfish. No significant differences in metal concn. were found between the sexes or size classes within sites. The lowest concn. of any of the metals was found in the muscle. The gills have significantly higher concn. of Cu compared to exoskeleton and muscle. The highest concn. of Pb was found in the exoskeleton $>$ gills $>$ viscera resp. Highest concn. of Zn was found in the gills and viscera. The highest Cd concn. were found in the gills. VJG

## 106

**Heavy metals in mussels (Mytilus galloprovincialis) from the gulf of La Spezia and from the promontory of Portofino, Italy.**

Capelli, R.; Contardi, V.; Fassone, B.; Zanicchi, G.
*Marine Chemistry* 6 (2) 179–185 (1978) [12 ref. En]
[Inst. of General & Inorganic Chem., Univ. of Genoa, Genoa, Italy]

In different samples of Mytilus galloprovincialis Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb and Zn were determined by AAS. The mussels were taken from 11 sites in the Port of La Spezia. Typical concn. ranges (μg/g dry wt.) were as follows: Cd, 2.0–6.8; Co, 0.8–3.2; Cr, 5.8–19.5; Cu, 6.9–33.7; Hg, 0.15–0.38; Mn, 11.8–37.8; Ni, 1.3–10.9; Pb, 13.9–44.6 and Zn, 203–379. Other samples were collected at 4 sites on the Promontory of Portofino and the following values were obtained: Cd, 0.8–1.1; Co, 2.6–2.9; Cu, 3.3–4.2; Hg, 0.09–0.15; Mn, 6.3–9.1; Ni, 1.2–2.4; Zn, 120–140. AS

## 107

**[Determination of heavy metals and selenium in fish from the rivers and lakes of Upper Austria. II. Lead, cadmium, scandium, chromium, cobalt, iron, zinc and selenium.]** Bestimmung von Schwermetallen und Selen in Fischen aus oberösterreichischen Gewässern. II. Blei, Cadmium, Scandium, Chrom, Cobalt, Eisen, Zink und Selen.

Teherani, D. K.; Stehlik, G.; Tehrani, N.; Schada, H.
*Environmental Pollution* 18 (3) 241–248 (1979) [9 ref. De, en] [Inst. für Biol., Forschungszentrum Seibersdorf, A-2444 Seibersdorf, Austria]

119 samples of fish, which were caught in Sept. 1974 in Upper Austrian waters, were analysed for Zn, Fe, Co, Cr, Sc and Se content by neutron activation analyses and for Pb and Cd by AAS. The concn. values found for Zn ranged between 13 and 44 p.p.m., for Fe between 11 and 111 p.p.m., for Co between 0.01 and 0.40 p.p.m., for Cr between 0.02 and 0.21 p.p.m., for Pb between 0.01 and 0.28 p.p.m., with a single exception, for Cd between 0.01 and 0.13 p.p.m., and for Se between 0.62 and 2.02 p.p.m. The concn. of Sc was below the detection limit (0.5 parts/$10^9$) for all fish samples analysed. AS

## 108

**Cement kiln dust in complete diets for finishing steers and growing lambs.**

Wheeler, W. E.; Oltjen, R. R.
*Journal of Animal Science* 48 (3) 658–665 (1979)
[22 ref. En] [USDA, Beltsville, Maryland 20705, USA]

2 trials were conducted to study the influence of cement kiln dust (CKD) and/or protein level in complete diets on the feedlot performance and carcass merit of finishing steers and feedlot performance of growing lambs. All diets contained 53% forage and 47% concentrate. Steers (average initial wt. 309 kg) fed diets containing 3.5% CKD without and with supplemental protein (SPN) had higher average daily gains (1.39, 1.52 vs. 0.83, 1.11 kg/day) while feed/gain ratios were improved (8.2, 6.9 vs 14.1, 10.2 kg) over steers fed diets without CKD and without or with SPN during the 140-day study. Carcasses from steers fed CKD had 0.7 and 0.9 cm more fat over the 12th rib, higher marbling scores and higher grades (high choice vs. high good) than carcasses from steers fed the diet containing SPN without CKD. Steers fed the diet containing no SPN without CKD had the lowest feedlot performance and carcass merit. Kidney tissue from both groups fed CKD was higher in Pb (0.78 vs. 0.36 p.p.m.) and Se (1.19 vs. 0.13 p.p.m.) than tissues from steers fed diets containing no CKD. AL

## 109

**Lead levels in sheep organs resulting from pollution from automotive exhausts.**

Ward, N. I.; Brooks, R. R.; Roberts, E.
*Environmental Pollution* 17 (1) 7–12 (1978) [8 ref. En]
[Dep. of Chem., Massey Univ., Palmerston North, New Zealand]

Intake of Pb was studied via lungs + digestive system, ingested from feed alone and inhaled via lungs alone. 3 experiments were: (i) 62 sheep grazed 6 months on a highway (5000 vehicles/24 h) verge, then removed from the highway vicinity for 6 months; (ii) 10 sheep kept 9 days 1 km away from vehicles but fed contaminated grass from a highway verge (8000 vehicles/h); and (iii) 4 sheep penned for 5 days on a highway verge but given uncontaminated feed. Levels of Pb in blood were monitored and animals showing high levels were selected for slaughter (10 of (i), 4 of (ii), all of (iii)) and detailed analyses of 17 organs by AAS. Results are tabulated and compared with mean values for Pb content of organs sampled at a freezer factory. After 6 months beside the road the (i) sheep showed significant accumulations of Pb, highest concn. being (μg/g) kidney cortex 154, liver 20 and bones 30, but with only slight Pb accumulation in edible muscle. After the further 6 months away from the road, the kidney value had fallen to 12 μg/g but remained unchanged in bones (probably a permanent reservoir of Pb). After 9 days the (ii) sheep showed significant Pb accumulation in liver/kidney, but little in bone (probably slower). The (iii) sheep showed Pb accumulation by both routes, but relatively high in lungs (inhalation) and low in liver (ingestion). It is concluded that roadside grazing is undesirable, but if unavoidable, liver/kidneys should be discarded for human consumption. ELC

## 110

**[Determination of traces of heavy metals by anodic stripping voltammetry with a glassy carbon electrode.]**
Watanabe, F.; Takamura, K.
***Annual Report of the Tokyo College of Pharmacy [Tokyo Yakka Daigaku Kenkyu Nenpo]*** 27, 748–754 (1977) [7 ref. Ja, en]

Anodic stripping voltammetry with a glassy C electrode was examined in detail in order to decide the optimum conditions for detn. of traces of some heavy metals. The method was applied to the detn. of $Cu^{2+}$ and $Pb^{2+}$ in waste water and glaze of some tablewares. The method is straightforward and simple to use for the detection and the detn. of $Cu^{2+}$, $Pb^{2+}$, $Cd^{2+}$, etc. in concn. of $\geq 1.0 \times 10^{-8}$M. AS

## 111

**Sample homogenization procedure for determination of lead in canned foods.**
Jones, J. W.; Boyer, K. W.
***Journal of the Association of Official Analytical Chemists*** 62 (1) 122–128 (1979) [5 ref. En] [FDA, Div. of Chem. & Physics, Washington, DC 20204, USA]

To improve the homogeneity of canned foods before Pb detn., composited samples or single can contents (150–500 g) are treated with an equal wt. of dil. $HNO_3$, and then thoroughly blended in a high efficiency, probe-type Polytron homogenizer; subsamples are then either dry-ashed or wet-ashed in preparation for analysis. Within-can variability is reduced from the 20–50% coeff. of variation range obtained with conventional blending procedures to a coeff. of variation of <5% by using the procedure described. Precision data for Pb, using both the probe-type and conventional blade-type homogenizers, are compared. The procedure described for Pb detn. was used to analyse a number of canned products [fruit, vegetables, meats, salmon and soup]. Data indicate that the Polytron + dil. acid procedure improves overall Pb homogeneity for subtle as well as severe initial Pb heterogeneity. AS

## 112

**[Heavy metals in food additives.]**
Seco, M. M.
***Alimentaria*** No. 100, 31–38 (1979) [12 ref. Es]

Aspects discussed include: definition of additives; the potential for cumulative toxicity of heavy metals; the need for certain heavy metals (Cu, Zn) in the diet; presence of Cu, Zn, Cd, Hg, Pb and As in foods, and sources of contamination; acceptable daily intakes of heavy metals; and analytical techniques for detn. of heavy metals in foods. AJDW

## 113

**[Heavy metal contents in soils and plants after application of extremely high amounts of sewage sludge.]** Schwermetallgehalte in Böden und Pflanzen nach extrem hohen Klärschlammgaben.
Diez, T.; Rosopulo, A.
***Landwirtschaftliche Forschung*** Sonderheft 33/I, 236–248 (1977) [13 ref. De, en, fr] [Bayerische Landesanstalt für Bodenkultur & Pflanzenbau, Menzingerstrasse 54, D-8000 München 19, Federal Republic of Germany]

The concn. of heavy metals were investigated in soils and crops after very high applications of sewage sludge (400–700 t in DM over a 50 yr period). High concn. of Zn, Cd, Cu, Cr, Pb and Hg were found in the soil. Concn. in the crops (wheat, barley, oats, corn, potatoes) were generally much higher (100–>500 fold) in the vegetative portions than in grains and tubers. Cd, Cr and Ni were taken up more readily than Cu, Co, Pb and Hg. The absolute heavy metal contents in the portions used for food were not excessively high except for Cd; concn. of Cd (mg/kg DM) was 1.0–1.3 in wheat, 0.12–0.06 in barley, 0.42 in oat, 0.20 in maize kernels, and 0.36–0.54 in potato tubers. RM

## 114

**Quantities of lead producing health effects in humans.**
Mahaffey, K. R.
***Environmental Health Perspectives*** 19, 285–295 (1977) [76 ref. En] [Div. of Nutr., Bureau of Foods, FDA, Washington DC, 20204, USA]

Levels of Pb ingestion and inhalation producing increased body burden of Pb and clinical toxicity in adults and children are compared with usual levels of exposure. The magnitude of Pb exposure from air, water and food is estimated. Sources of high level exposure to Pb are described; urban street dirt, house dust, and paint are particularly common sources of high concn. of Pb. Bioavailability of different Pb compounds is reviewed as well as factors affecting susceptibility to Pb. AS

## 115

**Neurochemical changes induced by dietary lead chronic assumption.** (In 'Chemical toxicology of food' [see FSTA (1979) 11 10C579].) [Lecture]
Govoni, S.; Spano, P. F.; Trabucchi, M.
pp. 381–385 (1978) [18 ref. En] [Dep. of Pharmacology & Pharmacognosy, Univ. of Milan, Milan, Italy]

A potentially serious source of Pb in foods is the result of environmental pollution. Mammalian central nervous system is particularly sensitive to the toxic effects of lead, mainly during the 1st period of life. We studied some neurochemical parameters related to neutrotransmitter function in the brain of Pb-intoxicated rats (provided with 2.5 mg/ml lead acetate in drinking water). AS

## 116

**[Heavy metals contents of fresh edible fungi in the Bavarian and Oberpfälz forest.]** Zum Schwermetallgehalt von frischen Speisepilzen des Bayer. und Oberpfälzer Waldes.
Böttger, M.
***Industrielle Obst- und Gemüseverwertung*** 63 (16) 431–433 (1978) [28 ref. De] [Landesuntersuchungsamt für das Gesundheitswesen Nordbayern, Regensburg, Federal Republic of Germany]

Cd, Pb and Hg contents were determined in samples of 16 spp. of edible fungi collected in the Bavarian and Oberpfälz forest. Tabulated results showed mean Cd

0.34 p.p.m. fresh wt. basis (range, 2.76–0.02), Pb 0.23 p.p.m. (1.02–0.03) and Hg 0.07 p.p.m. (0.56–<0.001). Previously reported high Cd concn. in mushrooms (Psalliota spp.) were not confirmed, as most samples were P. campestris, which does not accumulate Cd. Low metal concn. were found in the popular spp. Cantharellus cibarius and Xerocomus badius. 73.6% of the samples were within the Federal German 0.05 p.p.m. tolerance for Hg and 92.7% were within the 0.05 p.p.m. tolerance for Pb (and at the lower limit of 0.5–0.2 p.p.m. Pb for vegetables and fruits). Only 26.8% were within the 0.1 p.p.m. limit for Cd. RM

## 117

**Quantitative studies of mercury and cadmium deposition in Japanese quail through multiple generations.**
Eskeland, B.; Gullvag, B. M.; Nafstad, I.
*Acta Agriculturae Scandinavica* 29 (2) 113–118 (1979) [8 ref. En] [Dep. of Poultry & Fur Anim. Sci., Agric. Univ. of Norway, 1430 As-NLH, Norway]

This paper gives data from a 4-generation feeding trial with Japanese quail, fed diets with or without various Hg levels (≤8 p.p.m.) and, in the 3rd and 4th generations, with or without added Cd (≤15 p.p.m.). Tables of data are given for Pb and Cd concn. in tissues (brain, liver, heart) and in egg yolk, albumen and shell. Hg concn. in eggs and tissues tended to increase with increasing dietary Hg concn.; Cd concn. of tissues (but not eggs) increased with increasing dietary Cd concn. Effects of interaction between dietary Hg and Cd levels on tissue Hg concn. are described. AJDW

## 118

**[Official methods of analysis. Determination of lead in molluscs. Determination of mercury in molluscs.]**
Anon.
*Bollettino dei Chimici dei Laboratori Provinciali* 4 (12) 236–238; 238–240 (1978) [It]

Working directions are given for detn. of Pb and Hg in molluscs. No data are provided on limits of detection, recovery or reproducibility. RM

## 119

**Trace metals in the common mussel, Mytilus edulis (L.), and in the alga Fucus vesiculosus (L.) from the region of the Sound (Öresund).**
Phillips, D. J. H.
*Environmental Pollution* 18 (1) 31–43 (1979) [29 ref. En] [Dep. of Zool., Univ., Uppsala, Sweden]

Concn. of Zn, Cd, Pb and Fe were determined in whole soft parts of mussels from a total of 20 locations in the area of the sound between Sweden and Denmark. Results for mussels agreed broadly with those reported previously for this region, indicating a northward decrease in available metal concn. Mean Zn concn. ranged from 3.96 to 45 µg/g dry wt., Cd from 0.7 to 7.6 µg/g dry wt., Pb from 20 to 202 µg/g dry wt., and Fe from 39 to 346 µg/g dry wt. SP

## 120

**Experimental evaluation of lead toxicity in cattle.**
Milhaud, G.; Mialot, M.; Pinault, L.; Parodi, A. L.
***Recueil de Medecine Veterinaire*** 154 (11) 943–949 (1978) [17 ref. Fr, en, es] [Service de Pharmacie & Toxicol., Ecole Nat. Veterinaire d'Alfort, F94704 Maisons-Alfort Cedex, France]

Groups of cattle 13.5 months old, and weighing approx. 500 kg were fed 10 mg Pb/kg body wt. daily for 14 or 28 days. Effects on wt. gain and blood biochemical characteristics are reported. No clinical symptons were observed. Pb contents were measured in liver, kidney and bone at the end of the feeding period. Pb contents in liver were (p.p.m. fresh wt.): control 0.29 ± 0.20, 14-day Pb group 5.66 ± 2.17 and 28-day Pb group 6.46 ± 1.33; corresponding results for kidney Pb contents were 0.21 ± 0.05, 7.43 ± 1.54 and 8.67 ± 1.09. DIH

## 121

**Graphite-furnace atomic absorption spectrometric determination of lead and cadmium in foods after solvent extraction and stripping.**
Dabeka, R. W.
*Analytical Chemistry* 51 (7) 902–907 (1979) [22 ref. En] [Div. of Food Res., Health Protection Branch, Health & Welfare Canada, Tunney's Pasture, Ottawa, Canada K1A 0L2]

Solvent extraction of Pb with ammonium pyrrolidine dithiocarbamate and methyl isobutyl ketone, i. e. the APDC-MIBK extraction system, was modified to enable detn. of Pb and Cd in foods with detection limits of 20 and 1 ng, resp. Metals were extracted from $HNO_3$-$HClO_4$ digests at pH 1.4–1.8 into MIBK (70 ml), stripped into $HNO_3$ (3%) and $H_2O_2$ (8%), and the stripping solution was modified with a solution of $NH_3$ and ammonium dihydrogen phosphate to optimize determinative precision and accuracy. Advantages were: few interferences and sample-size limitations (≤13 g dried kidney was analysed); consistent determinative precision (usually about 1% s/X using graphite-furnace atomization); good accuracy for 5 NBS standard reference materials; standards did not require extraction; and 'acid-soluble' and 'acid-insoluble' Pb could be sequentially determined. AS

## 122

**[Environmental pollution with Pb, Cd and Cr, and effects on crops and foods in a defined area of the province of Rome.]** [Lecture]
Bencivenga, B.; Pallotti, G.; Sanna, M.; Simonetti, T.; Bonifazi, M.; Porrozzi, G.
*Bollettino dei Chimici dei Laboratori Provinciali* 5 (1) 88–93 (1979) [15 ref. It] [Lab. Chimico Provinciale, Via Saredo 52, 00173 Rome, Italy]

Analysis of food produced in an area of 3600 ha near Rome airport (Fiumicino) for Pb, Cd and Cr contamination revealed max. Pb concn. (mg/kg) of 1.70 in vegetables, 0.97 in meat, 2.40 in liver, 0.30 in milk and 0.30 in wine; corresponding Cd concn. were, 0.08, 0.08, 0.32, 0.02 and 0.03; corresponding Cr concn. were 1.16, 1.30, 14.13, 0.04 and 0.09. Results showed that Pb contamination is the main health hazard. [See FSTA (1979) 11 11A776.] RM

### 123

**[National Food Administration recommendations concerning growth of vegetables near roads with heavy traffic.]**
Slorach, S.; Boström, C.-E.
***Statens Livsmedelsverks Meddelanden*** M 3/79, 4pp. (1979) [Sv] [Statens Livsmedelsverk, Box 622, 751 26 Uppsala, Sweden]

The danger of Pb and polycyclic aromatic hydrocarbon contamination of fruit and vegetables grown near roads is discussed, with reference to factors influencing the level of contamination, the significance of the health hazard, recommendations concerning cultivation of fruit and vegetables near roads (covering the undesirability of growing leafy vegetables, and the desirability of washing or peeling of produce); and the unsuitability of fresh vegetables containing > 0.3 mg Pb/kg for human consumption. AJDW

### 124

**[Release of lead and cadmium from porcelain and ceramic utensils. II. Release of toxic metals into foods.]** Untersuchungen über die Abgabe von Blei und Cadmium aus Porzellan- und Keramikgeschirr. II. Schadmetallabgabe an Lebensmittel.
Dömling, H. J.; Kolb, C.
***Deutsche Lebensmittel-Rundschau*** 75 (5) 152–156 (1979) [15 ref. De, en, fr] [Landesuntersuchungsanstalt für das Gesundheitswesen Nordbayern, Erlangen, Federal Republic of Germany]

Comparative studies on uptake of Pb and Cd from decorated porcelain or ceramic utensils by 4% acetic acid solution and by acidic foods under identical test conditions are described. Foods studied included cultured dairy products, wine, beer, fruit juices, soft drinks, fruit and vegetable products, condiments, sauces, mineral water and coffee. Tables of data are given showing food product pH, the Pb and Cd concn. in the food before and after the test, Pb and Cd concn. in the 4% acetic acid solution after the test, and Pb or Cd uptake by food as % of uptake ty the acetic acid test solution. Extremely high heavy metal uptake values were recorded for individual samples of cola drink and rhubarb compote (461.9 and 246.1% of the value for acetic acid solution, resp.); all other food samples had heavy metal uptakes lower than that for 4% acetic acid (0.4–83.7% for Pb, 9.3–86.8% for Cd). The relatively high levels of Pb and Cd which may be achieved suggest that holding of acidic foods in decorated ceramic of porcelain utensils may present a significant health hazard. [See FSTA (1978) 10 2C38 for part I.] AJDW

### 125

**[Residue problems caused by heavy metals and arsenic in feed and food.]** Rückstandsprobleme durch Schwermetalle und Arsen in Futter- und Lebensmitteln.
Kühnert, M.; Fuchs, V.; Polo, C. A.
***Monatshefte für Veterinärmedizin*** 34 (6) 206–212 (1979) [28 ref. De, en ru] [Sektion Tierproduktion & Vetmed., Karl-Marx-Univ. Leipzig, German Democratic Republic]

Problems with residues of Pb, Cd, Hg and As in foods are discussed, with reference to their toxicity, distribution within the body, accumulation in tissues, major sources of contamination, and possible interaction with other contaminants. Major sources of contamination of foods and feeds include industrial effluents and motor vehicle exhaust gases. Establishment of tolerances for heavy metals in foods is also considered. IN

### 126

**[Migration of metals from tinplate containers. Criteria for evaluation of the state of conservation of foods.]** [Lecture]
Bocca, A.; Femmine, P. delle; Papi, P.; Stacchini, A.
***Bollettino dei Chimici dei Laboratori Provinciali*** 5 (1) 62–68 (1979) [13 ref. It] [Istituto Superiore di Sanita, Viale Regina Elena 291, 00161 Rome, Italy]

Sn, Fe and Pb contents were determined in canned peeled tomatoes, double tomato concentrate, green beans and pears in syrup stored at ambient temp. for ≤ 1 yr. Results, shown graphically and in a table, revealed high initial and final Sn contents in peeled tomatoes (rise from 22.2 to 81 mg/kg) and pears (from 57 to 92, or 14 to 103 mg/kg after 2 processing cycles) though the rise never exceeded 90 mg/kg yr. As for Sn, products with low initial Fe concn. showed no significant rise; max. concn. were found in tomato concentrate (from 43.5 to 55.0 mg/kg). Max. Pb concn. after 1 yr were 1.18 mg/kg in tomato concentrate, and 0.55 in green beans and pears. [See FSTA (1979) 11 11A776.]

### 127

**Toxic trace metals in food. I. A new voltammetric procedure for toxic trace metal control of wines.**
Golimowski, J.; Valenta, P.; Nürnberg, H. W.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 168 (5) 353–359 (1979) [38 ref. En, de] [Inst. of Chem., Nuclear Res. Cent. (KFA) Jülich, D-5170 Jülich, Federal Republic of Germany]

A procedure for detn. of the toxic trace metals Cu, Pb and Cd in wines is described, based on liberation of organically-bound heavy metals by addition of $H_2O_2$ and UV photolysis under a 500 W Hg lamp, followed by detn. by differential pulse stripping voltammetry using a Hg film electrode for Pb and Cd, and a gold electrode for Cu. Data are given for 5 wines, showing comparative results for heavy metal detn. by this technique and a method using wet digestion rather than UV photolysis. The results show that the photolysis procedure gives full liberation of organically-bound heavy metals. Detection limits and precision of the UV photolysis/voltammetric method are good. Interference by heavy metal contamination during the analysis was slight. It is concluded that this method is suitable for testing of wines for trace metals; the technique could easily be expanded to cover detn. of Hg or Zn. AJDW

## 128

**Determination of cadmium, lead and copper in wine by differential pulse anodic stripping voltammetry.**
Oehme, M.; Lund, W.
***Zeitschrift für Analytische Chemie*** 294 (5) 391–397 (1979) [19 ref. En, de] [Dep. of Chem., Univ. of Oslo, Box 1033, Blindern, Oslo 3, Norway]

The simultaneous detn. of Cd, Pb and Cu in wine by differential pulse anodic stripping voltammetry at the hanging Hg drop electrode is described. Wine samples are decomposed in a mixture of $H_2SO_4$ and $H_2O_2$ at 180°C. The procedure is controlled by recovery tests and compared with other wet digestion methods. Results for 5 red and 5 white wines of different origin are tabulated. Pb levels (0.065–0.230 p.p.m.) were below the accepted min. but some wines contained relatively large concn. of Cu (0.08–1.04 p.p.m.). Cd levels were very low (1.4–6.6 parts/billion). AS

## 129

**Toxic trace metals in food. II. A comparative study of the levels of toxic trace metals in wine by differential pulse anodic stripping voltammetry and electrothermal atomic absorption spectrometry.**
Golimowski, J.; Valenta, P.; Stoeppler, M.; Nürnberg, H. W.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 168 (6) 439–443 (1979) [18 ref. En, de] [Inst. of Chem., Nuclear Res. Cent. (KFA), D-5170 Juelich 1, Federal Republic of Germany]

A method consisting of UV-pretreatment followed by differential pulse anodic stripping voltammetry (DPASV) using an Hg film electrode (for Pb and Cd) or an Au electrode (for Cu) was compared with the more widely used electrothermal AAS method for analysis of toxic metals in wine. The AAS pretreatment is more rapid, but matrix problems with specific metals are encountered. Results for Cd are not compared as precise results are not obtainable with AAS below 1 µg/l. Results of detn. of Pb and Cu in 32–34 wines are compared graphically for the 2 methods. For Pb correlation coeff. was 0.96 and slope angle of regression line was 38.6°; for Cu these values were 0.98 and 53.9°, resp., if AAS samples were diluted with 2M $HNO_3$ (1:4), and 0.96 and 43.8°, resp. if AAS samples were diluted 1:4 with water. The findings confirm the value of study of a matrix with 2 independent methods of analysis. It is suggested that the better precision of the DPASV method would partially compensate for the longer pretreatment procedure, as fewer replicates would be required. Contents of Cd, Pb and Cu as determined by DPASV in 36 wines of vintage 1973–1977 from Germany, France and Italy are tabulated. Ranges found are (µg/l.) Cd 0.2–3.2, Pb 48–170 (+ 1 sample 467), and Cu 20–780 (+ 1 sample 2000). [See FSTA (1979) 11 11H1779 for part I.] DIH

## 130

**Direct determination of traces of heavy metals in canned vegetables by arc spectrography.**
Farhan, F. M.; Habibi, N.; Mofidi, J.; Eyvani, J.
***Journal of Agricultural and Food Chemistry*** 27 (3) 637–638 (1979) [5 ref. En] [Lab. of Analytical Chem., Univ. of Tehran, Tehran, Iran]

A new, simple, and rapid method for direct and simultaneous detn. of traces of Fe, Cu, Pb, Sn, Ag and Mn in brined canned vegetables is described. Pure graphite powder is used as spectroscopic buffer and for the preparation of standard powders. Pure S is added to the sample before calcination to bind trace metals as sulphides and prevent volatilization. A quartz spectrograph of high resolving power is used for this detn. AS

## 131

**[Lead contents in canned tomato products.]** [Lecture]
Franconi, U.; Morini, F.; Mossone, M.
***Bollettino dei Chimici dei Laboratori Provinciali*** 5 (1) 79–87 (1979) [11 ref. It] [Lab. Chimico Provinciale, Via XIV Settembre 75, 06100 Perugia, Italy]

After a preliminary study on the Pb contents of fresh tomatoes and glass-bottled concentrates, the changes in Pb contents during 2 yr storage at ambient temp. were determined in canned peeled tomatoes and double and triple concentrates (total 120 samples). Results, shown graphically and in a table, revealed mean contents of approx. 0.1 p.p.m. in fresh fruits, 0.6 p.p.m. in double or triple concentrates, and a rising trend, especially during the first 12 months of storage for concentrates and the last 6 months for peeled tomatoes, to mean values around 1.5 p.p.m. for double concentrate, 3.0 for triple concentrate, and 0.70 for peeled tomatoes; abnormally high values of 67 and 100 p.p.m. in single samples were not used in calculation of the means. Max. permissible levels proposed are 0.3 p.p.m. for peeled tomatoes, and 1 p.p.m. for double and triple concentrates; declaration of the canning date on the label is also recommended. [See FSTA (1979) 11 11A776.] RM

## 132

**Sample preparation and the determination of lead in chewing gum by nonflame atomic absorption spectrometry.**
Fetterolf, D. D.; Syty, A.
***Journal of Agricultural and Food Chemistry*** 27 (2) 377–380 (1979) [9 ref. En] [Dep. of Chem., Univ. of Pennsylvania, Indiana, Pennsylvania 15705, USA]

A procedure for the dissolution of chewing gum by combined wet and dry ashing is described. Pb concn. in 10 var. of chewing gum were determined by the heated graphite tube atomizer technique of AAS. AS

## 133

**[Heavy metals and other elements in milk and milk products.]**
Cerna, E.; Cvak, Z.
***Prumysl Potravin*** 30 (2) 93–94 (1979) [Cs] [Vyzkumny Ustav Mlekarensky, Prague, Czechoslovakia]

Data on the contents of 4 metals in milk samples obtained in different parts of Bohemia and Moravia are tabulated. The average values with ranges were as follows (mg/kg): Cu, 0.084 (0.046–0.183) 105 samples; Fe, 0.42 (0.34–0.62) 175 samples; Pb, 0.032 (traces–0.40) 116 samples; and Zn, 4.36 (3.57–5.30) 123 samples. The incidence of other metals and trace elements in milk and sources of contamination are discussed. FL

### 134

**Uptake and loss of zinc and lead by mussels (Mytilus edulis) and relationships with body weight and reproductive cycle.**
Simpson, R. D.
***Marine Pollution Bulletin*** 10 (3) 74–78 (1979) [21 ref. En] [Environmental Biol. Sect., Australian Atomic Energy Commission, Private Mail Bag, Sutherland 2232, NSW, Australia]

Uptake and loss of Zn and Pb from the whole soft parts of mussels were investigated under natural conditions in N. E. England. Mussels with high concn. of these metals (in the Tyne estuary) were transferred to an area of low concn. (Coquet estuary), and vice versa. Transferred mussels appeared to equilibrate with higher Zn levels in approx. 3 months, but longer time would be needed for equilibration from high to low Zn levels and for both uptake and loss of Pb. Mussels from both areas were also kept in tanks, where they lost wt. and condition, and metal contents were measured periodically. This work suggests that phase of reproductive cycle (for animals in the environment) and condition (for animals in tanks) should be considered when reporting on levels of metals in mussels, especially in terms of concn. AL

### 135

**[A rapid decomposition process for large samples of biological materials and its use in the determination of trace amounts of heavy metals.]** Schnellverfahren für den Aufschluss von grösseren Mengen an Biomaterial zur analytischen Erfassung von Schwermetallspuren.
Scheubeck, E.; Nielsen, A.; Iwantscheff, G.
***Zeitschrift für Analytische Chemie*** 294 (5) 398–401 (1979) [12 ref. De, en] [Siemens AG, Postfach 3240, D-8520 Erlangen, Federal Republic of Germany]

20 g samples of biological material with 70–80% moisture content were pre-dried in a closed pressure vessel and then burnt in $O_2$. All traces of heavy metals appear quantitatively in a solution consisting of the condensates from drying and combustion products of the organic matrix. Decomposition takes <30 min. Hg, Cd, Pb and As at concn. of 50–250 parts/billion or in amounts of 1–5 µg were detected in beef or pork meat, liver and kidney with recoveries of 80–90%. AS

### 136

**[Determination of content of metals in canned poultry meat products.]**
Martynyuk, T. G.; Sevostyanova, N. I.
***Trudy, Vsesoyuznyi Nauchno-issledovatel'skii Institut Myasnoi Promyshlennosti*** 20, 40–45 (1976) [4 ref. Ru]

Methods for detn. of Pb, Cu and Sn recommended by COMECON were compared with standard Soviet methods (GOST) and other commonly used methods. Comparisons between 'wet' and thermal incineration of can contents showed that in practice the results for Cu and Pb were not influenced by the incineration method. For Sn the thermal method gave lower results. The sensitivity of methods recommended by the COMECON for detn. of Cu and Pb (0.2 mg/kg) was considerably better than that of the standard methods (5 and 10 mg/kg); for Sn the sensitivity of both methods was equal. The combination of 'wet' incineration and spectrophotometric detn. of metals permitted quicker analysis (by 5 to 6 h) in comparison with the standard methods. STI

### 137

**Trace metal content of livers and kidneys of cattle.**
Flanjak, J.; Lee, H. Y.
***Journal of the Science of Food and Agriculture*** 30 (5) 503–507 (1979) [17 ref. En] [Div. of Analytical Lab., Health Commission of NSW, PO Box 162 Lidcombe, 2141 NSW, Australia]

Results are presented for levels of trace metals as determined by AAS, in livers and kidneys of 190 cattle from 8 different locations in New South Wales. Mean and range for each of the trace metals, in p.p.m., in livers and kidneys, resp. were as follows (nd = not detected): As 0.013 (nd-0.09) and 0.018 (nd-0.10); Cd 0.08 (nd-0.80) and 0.43 (0.02-10.7); Cr 0.05 (nd-1.0) and 0.03 (nd-0.22); Co 0.07 (nd-0.45) and 0.03 (nd-0.25); Cu 18.0 (0.81-82.8) and 3.9 (1.84-9.2); Pb 0.14 (nd-0.85) and 0.22 (nd-2.29); Mn 2.72 (1.11-4.09) and 1.07 (0.58-1.67); Hg 0.005 (nd-0.050) and 0.006 (nd-0.177); Mo 0.88 (nd-2.41) and 0.31 (nd-1.85); Ni 0.33 (nd-4.82) and 0.46 (nd-5.80); Se 0.17 (0.01-0.63) and 1.10 (0.47-1.77); and Zn 37.5 (13.4-99.2) and 18.6 (12.9-31.6). Significant differences were observed in the trace metal levels in livers and kidneys from the different regions of the State and between the trace metal levels in livers and kidneys from the same region. Accuracy of the methods was confirmed by analysis of NBS No. 1577 Bovine Liver. AS

### 138

**Leaching of lead from ceramics.**
Henderson, R. W.; Andrews, D.; Lightsey, G. R.
***Bulletin of Environmental Contamination and Toxicology*** 21 (1/2) 102–104 (1979) [6 ref. En] [Dep. of Chem. & Physics, Francis Marion Coll., Florence, S. Carolina 29501, USA]

Glazed ceramic containers, (i) imported, (ii) commercial domestic and (iii) homemade domestic, were rinsed with distilled water and then filled with 5% acetic acid solution. The samples were covered with Pb-free Saran film and maintained at 85°C for 1 h. At the end of the treatment, the vol. of each extractant was made up to its original vol. Numbers of samples with Pb concn. of <0.5, 0.5–7, 7–100, and >100 mg/l., resp., in extractant were: (i) 12, 4, 0, 0; (ii) 49, 6, 0, 0; and (iii) 8, 6, 8, 11. The amount of Pb leached from the various ceramic containers ranged from <0.5 to 260 mg/l. extractant. In only a few instances did the concn. of Pb leached from (i) or (ii) exceed 0.5 mg/l., and no samples exceeded the FDA standard of 7 mg/l. Almost 60% of (iii) items leached excessively large amounts of Pb and exceeded FDA standards. VJG

### 139

**[Hygienic evaluation of foods from the standpoint of their contamination with harmful metals. II. Pb, Cd, Zn and Cu in 20 staple foods.]**
Nikonorow, M.; Piekacz, H.

***Roczniki Panstwowego Zakladu Higieny*** 29 (6) 611-626 (1978) [22 ref. Pl, ru, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku Panstwowego Zaklad Higieny, Warsaw, Poland]

During 1973-1974, contents of the title metals were determined in retail samples of market and dried milks, twarog (cheese), wheat and rye flours, mixed and rye bread, Graham and Poznan rolls, pork, beef, veal, chicken, hen's eggs, tomatoes, carrots, potatoes, white cabbage and apples. Additionally, some samples were also analysed in 1976, and a comparison was made of all the results to determine whether regional differences and time of sampling were important. Analyses were made by AAS and colorimetry, and results are tabulated in detail. Overall results indicated that level of contamination of foods with Pb, Cd, Zn and Cu in Poland is comparable to that in other countries; place and time had no marked effect on the results (with a few exceptions, which are considered to require further study). [See FSTA (1978) 10 11C421 for part I.] HBr

### 140

**[Effect of tin on rats. I. The inverse voltammetric determination of tin in the presence of lead in biological material after extraction.]** Zinnwirkung auf Ratten. I. Die inversvoltametrische Bestimmung von Zinn neben Blei in biologischem Material nach Extraktion.
Woggon, H.; Raab, M.; Jehle, D.
***Nahrung*** 23 (5) 563-568 (1979) [12 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

1-5 g of plant material (previously dried at 80°C) or animal material (previously freeze-dried) is pre-ashed by heating with 1-5 ml 20% $H_2SO_4$, then ashed in a muffle oven (450-500°C). The carbon-free ash residue is then dissolved in 10 ml of 0.1N perchloric acid; this solution is then extracted by shaking with 5 ml of 2% diethylammonium diethylthiocarbamate (DADTC) solution in chloroform, this extraction being repeated twice, using fresh DADTC each time, the organic phase being discarded. The aqueous phase is heated to 50°C, mixed with 2 ml of 8% thioglycolic acid solution, and re-extracted with 5 ml DADTC solution. 5 ml of the organic residue are evaporated to dryness, and the residue is heated with 2-3 ml of a mixture of conc. $H_2SO_4$, conc. $HNO_3$ and 70-72% $HClO_4$, and evaporated to dryness. The residue is re-heated with additional acid mixture until a carbon-free residue is obtained. The residue is then dissolved in 20 ml of 12% HCl, and Sn is determined by inverse voltammetry using a stationary Hg electrode and a temp. controlled test cell. Recoveries for various foods were: potatoes 91.5 ± 5.7%; bovine kidney 85.4 ± 23%; bovine liver 80.3 ± 13.1%; and milk 70.2 ± 10.9%; little interference by other metals is likely. IN

### 141

**[Heavy metal contamination from food.]** Lebensmittel als Quelle der Schwermetallbelastung des Menschen.
Käferstein, F. K.
***Schlachten und Vermarkten*** 78 (11) 372-374 (1978) [9 ref. De] [Bundesgesundheitsamt, Postfach, 1000 Berlin 33]

The sources of excess heavy metals (Pb, Cd and Hg) intake from food are reviewed. Main sources of Pb are fruits and vegetables, liver and kidneys and bone particles, of Cd are some edible fungi, mussels, liver and kidneys, and of Hg are some edible fungi, fish and fish products. RM

### 142

**Lead caps in wine bottles and their potential problems.**
Wai, C. M.; Knowles, C. R.; Keely, J. F.
***Bulletin of Environmental Contamination and Toxicology*** 21 (1/2) 4-6 (1979) [4 ref. En] [Dep. of Chem., Univ. of Idaho, Moscow, Idaho 83843, USA]

Many grape wines are bottled using a cork sealed with a metal cap (primarily of Pb on the better wines) and the wines are usually stored on their side. As a result of cork porosity wine will occasionally be in contact with the metal cap. The X-ray powder diffraction pattern obtained from the white powdery substance frequently found on corroded metal caps, indicates that it consists of lead carbonate hydroxide $2PbCO_3 \cdot Pb(OH)_2$ and its hydrated form $(3PbCO_3 \cdot 2Pb(OH)_2 \cdot H_2O)$. This corrosion material deposited around the mouth of the bottle is thus a potential source of contamination during the consumption of wine. (i) red wine, (ii) white wine and (iii) red wine (little corrosion material present) were pipetted out of the bottle and poured out of the bottle without removal of corrosion deposits resp., giving Pb levels in p.p.m. of (i) 0.31, 1.6; (ii) 0.23, 1.7; and (iii) 0.15 and 0.4. There is no federal regulation regarding the safe level of Pb in wine, but max. acceptable levels in Canada and Germany are 0.5 and 0.3 p.p.m. It is shown that the use of Pb caps on wine bottles could result in relatively high levels of Pb intake for consumers of older wines. If corrosion is observed it should be removed prior to extracting the cork. VJG

### 143

**Zinc, copper, lead and cadmium contents in Japanese green tea.**
Tsushida, T.
***JARQ (Japan Agricultural Research Quarterly)*** 11 (4) 211-214 (1977) [9 ref. En] [Tea Tech. Div., Nat. Res. Inst. of Tea, Japan]

Zn, Cu, Pb and Cd contents in samples of 139 green teas presented at the National Tea Contest at Kagoshima in 1974 were determined by combination of isobutyl ketone extraction of iodide with AAS (Cu, Pb and Cd) and AAS alone (Zn). Ranges and means found (µg/g) were: Zn, 23.4-100.5 and 54.4; Cu, 4.7-36.5 and 11.4; Pb, 0.11-1.93 and 0.49; and Cd, 0.013-0.098 and 0.036. Changes in contents of these 4 metals in tea leaves during growth and development are shown. Cause of Pb contamination in some samples is also discussed briefly. VJG

### 144

**Direct determination of copper, lead and cadmium in tea infusions by flameless atomic absorption spectrometry.**
Tsushida, T.; Takeo, T.

*Agricultural and Biological Chemistry* 43 (6) 1347–1348 (1979) [8 ref. En] [Nat. Res. Inst. of Tea, Kanaya, Haibara, Shizuoka, Japan]

Cu and Pb concn. were determined in tea infusions by directly injecting 5 μl infusion into the carbon tube of the furnace for flameless AAS. Calibration curves were constructed by addition of appropriate metal concn. to tea infusions under test. Cu contents of 4 green and 3 black teas and of their 1st & 2nd infusions (3 g/100 ml water) are tabulated. Mean Cu content of green teas was 11.2 μg/g, and mean Cu concn. of 1st & 2nd infusions were 83.4 and 27.8 ng/ml, resp. Corresponding figures for black teas were 19.4 μg/g, and 127.5 and 64.0 ng/ml. Highest Cu content and concn. in infusions of green tea was given by Kagoshima and of black tea by Assam. Mean and range of Pb concn. of infusions (ng/ml) was for green tea 5.6 (4.3–9.8) and black tea 5.1 (0.6–13.3). Cd concn. in infusions were below the limit of detection, 0.2 ng/ml. DIH

## 145

**[Pesticide residues and heavy metals in the 1974 and 1975 Federal German wheat and rye harvests.]** Gehalt an Pflanzenschutzmittel-Rückständen und Schwermetallen in den deutschen Weizen- und Roggenernten 1974 und 1975.
Seibel, W.; Ocker, H.-D.
*Landwirtschaftliche Forschung* 32 (1/2) 186–196 (1979) [7 ref. De, en, fr] [Bundesforschungsanstalt für Getreide- & Kartoffelverarbeitung, Schützenberg 12, D-4920 Detmold, Federal Republic of Germany]

Analyses of about 200 samples/yr of Federal German bread rye and wheat in 1974 and 1975 showed a continuing fall in lindane, DDT and HCB contents. ⅔ of the samples contained lindane and HCB residues; DDT, α-HCH and aldrin were detected only in isolated cases. Only 1 of 200 samples exceeded the legal tolerance for lindane (0.345 p.p.m., vs. 0.1 p.p.m. tolerance). Hg contents were < 0.01 p.p.m. and Pb contents 0.04–0.4 p.p.m.; Cd contents showed a slight rise over previous yr, with 5% of wheat samples containing > 0.1 p.p.m. Pb contents were 0–0.18 p.p.m. (mean, 0.049–0.04) in wheat in 1974 and 1975 and 0.019–0.359 p.p.m. (mean 0.077) in rye in 1975. RM

## 146

**Trace metals in some fish species of South Carolina.**
Koli, A. K.; Sandhu, S. S.; Canty, W. T.; Felix, K. L.; Reed, R. J.; Whitmore, R.
*Bulletin of Environmental Contamination and Toxicology* 20 (3) 328–331 (1978) [5 ref. En] [Dep. of Natural Sci., S. Carolina State Coll., Orangeburg, S. Carolina 29117, USA]

Samples of fish (shrimp, silver snapper, brown trout, mudfish, white bass and catfish) were collected from freshwater and saltwater sources of rivers, lakes and ocean of South Carolina. Sample flasks were incubated in a constant temp. stirring water bath at 58°C until a clear solution was obtained in reagent-grade nitric acid. Triplicate samples of fish muscle were analysed by wet digestion and dry digestion methods. Trace metal levels of Fe, Zn, Mn, Cd and Cu were determined, in these fish, by flame atomic absorption using a Perkin-Elmer Model 306 spectrophotometer. Hg detn. was based on the wet digestion technique. Trace metal content in the above 6 fish spp. ranged as follows (p.p.m.); Cu, 0.01 (shrimp) – 0.20 (brown trout); Fe, 0.30 (mudfish) – 7.4 (shrimp); Zn, 0.02 (catfish) – 5.2 (shrimp); Mn, 0.02 (silver snapper) – 0.25 (shrimp); Cd, < 0.01 (all except shrimp) – 0.03 (shrimp); and Hg, 0.12 (white bass) – 0.63 (mudfish). VJG

## 147

**Concentrations of Cd, Cu, Mn, Pb, and Zn in fishes in a highly organic softwater pond.**
Wiener, J. G.; Giesy, J. P., Jr.
*Journal of the Fisheries Research Board of Canada* 36 (3) 270–279 (1979) [52 ref. En, fr] [Savannah River Ecology Lab., Aiken, S. Carolina, USA]

Concn. of Cd, Pb and 3 essential metals (Cu, Mn and Zn) in stocked bluegill (Lepomis macrochirus) and in the following resident fishes: warmouth, largemouth bass (Micropterus salmoides), chain pickerel (Esox niger), red fin pickerel (Esox americanus), American eel (Anguilla rostrata) and lake chubsucker (Erimyzon sucetta), were studied in an acidic, highly organic pond on the southeastern US coastal plain. Tabulated results are presented. Concn. of Cu, Mn and Zn in stocked and resident fish were apparently homeostatically controlled in liver tissue, axial musculature, and whole body. VJG

## 148

**Comparative studies on trace metal levels in marine biota. II. Trace metals in krill, krill products and fish from the Antarctic Scotia Sea.**
Stoeppler, M.; Brandt, K.
*Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 169 (2) 95–98 (1979) [40 ref. En, de] [Inst. of Chem., Nuclear Res. Cent., D-5170 Jülich, Federal Republic of Germany]

In whole krill, krill muscle tissue, krill products and in fillets of the antarctic fish Notothenia rossi marmorata, Dissostichus eleginoides, and Notothenia gibberifrons the levels of Cd, Pb, Cu, Ni, Hg and As were determined. Methods applied were electrothermal AAS for Cd, Pb, Cu, and Ni, cold-vapour and hydride-generation AAS for Hg and AS, resp., usually after $HNO_3$ pressure decomposition and for As followed by $HClO_4/H_2SO_4$ treatment. Quality control was performed by analysis of appropriate standard reference materials and working standards and by intercomparison with differential pulse anodic-stripping voltammetry (DPASV) for Pb and Cd. Mean values obtained related to fresh wt. for krill muscle meat (46 ng Cd/g, ≤50 ng Pb/g, 380 ng Cu/g, 130 ng Ni/g, ≤20 ng Hg/g, and 340 ng As/g) and fillets of Antarctic fish (≤3 ng Cd/g, ≤100 ng Pb/g, ≤200 ng Cu/g, ≤150 ng Ni/g, ≤50 ng Hg/g, and 300–1500 ng As/g) confirm the absence of toxic risks for human food according to present knowledge. Due to the somewhat higher, but not excessive, trace metal contents of krill products, these should be more suitable as a protein rich animal feed. AS

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FAB 28

# CONTENT AND ANALYSIS OF LEAD IN FOODS

SELECTED FROM VOLUME **12**
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

**under the direction of**

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

# INTRODUCTION

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

EDITOR

## 1

**[Collaborative study on the precisions of atomic absorption spectrophotometric determinations of cadmium, copper and lead in foods.]**
Koizumi, H.; Yasui, A.; Tsutsumi, C.; Matsunaga, R.; Yoshikawa, S.
***Report of the National Food Research Institute [Shokuryo Kenkyusho Kenkyu Hokoku]*** No. 34, 121-131 (1979) [6 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric., Forestry & Fisheries, Tokyo, Japan]

An atomic absorption spectrophotometry (AAS) procedure for heavy metal detn. was submitted to a 4-member collaborative study of precision, using samples of rye, rye powder and brown rice (dry ashed at 490°C for 8-20 h), and vegetable juice dry-ashed after addition of phosphoric acid. 2 methods of sample preparation were tested: a direct method in which the dry-ashed sample was taken up in 1N HCl and aspirated into the AAS flame; and a KI-methyl isobutyl ketone (MIBK) method in which the sample in 1N HCl was treated with conc. phosphoric acid and saturated KI, and the metal complexes then extracted into MIBK which was subsequently aspirated into the AAS flame. Within laboratories, the MIBK method was more precise for Cu detn. than the direct method, but between laboratories the direct method was better, with a permissible tolerance $<3\times$ that of the within-laboratory value. In the case of Cd detn., within-laboratory precisions were about the same for both methods; between laboratories, the MIBK method was more precise than the direct method for the rye samples. In all detn. of Cu, Cd and Pb in spiked samples the MIBK method was better. Levels of Pb in the natural samples were too low to assess the relative precisions of the methods. [From En summ.] JRR

## 2

**[Contamination with lead and cadmium. Study of heavy metals in bottled water, tap water and non-alcoholic beverages.]**
Meseguer Soler, M.; Farre Rovira, R.
***Alimentaria*** No. 104, 27-37 (1979) [6 ref. Es] [Dep. de Bromatologia, Toxicologia y Analisis Quimico, Univ. de Barcelona, Spain]

An outline is first given of the procedures involved in 4 different TLC methods for analysis of heavy metals; with formation of diethyldithiocarbamates, diethylammonium diethylthiocarbamates or dithizonates or using plates impregnated with EDTA. Relative merits and drawbacks of the 4 methods for analytical purposes are discussed. The 2nd method was used to determine the contents of Cd, Cu, Hg, Pb and Zn in numerous samples of bottled waters (including spring water), tonic waters, carbonated beverages, cola, natural mineral waters and mains water from 3 different areas. Results are given in terms of samples above or below the Spanish legal max. (0.01, 1.5, 0.001, 0.1 and 1.5 mg/l for Cd, Cu, Hg, Pb and Zn, resp.). HBr

## 3

**Lead in wild blackberries from suburban roadsides.**
Farmer, J. G.
***Journal of the Science of Food and Agriculture*** 30 (8) 816-818 (1979) [7 ref. En] [Dep. of Forensic Med., Univ. of Glasgow, Glasgow G12 8QQ, UK]

Blackberries were collected from 3 types of site in suburban areas of Glasgow: (i) 2 m distant from roads with moderate traffic use, (ii) 10 m from minor roads and (iii) in woods 0.5 km from roads. Pb was determined by digestion of samples in $HNO_3$, evaporation to dryness and analysis of the residue dissolved in HCl by AAS. Mean Pb contents and ranges found (mg/kg fresh wt.) were (i) 0.79 (0.13-1.24), (ii) 0.48 (0.43-0.52) and (iii) 0.14 (0.07-0.62). Mean Pb contents of washed samples were 0.63, 0.46 and 0.11 mg/kg for (i)-(iii), resp. Limits recommended by the Ministry of Agriculture, Fisheries & Food for Pb contents in fresh food, and canned fruits and preserves are 1 and 2 mg/kg, resp. It was suggested that the low values for Pb removed by washing may be the result of abnormally rainy weather during the fruit-bearing period. DIH

## 4

**[Lead and cadmium levels in meat and organ samples from horses, and possible effects on consumer health.]** Blei- und Cadmiumbelastungen in Fleisch- und Organproben bei Pferden und mögliche gesundheitsschädliche Wirkungen für den Verbraucher.
Holm, J.
***Fleischwirtschaft*** 59 (5) 737-739 (1979) [8 ref. De, en] [Staatliches Veterinäruntersuchungsamt, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

The muscle, liver and kidney of 68 horses from the Federal Republic of Germany and 40 from Poland were analysed for Pb and Cd contents by the AAS and graphite oven techniques. Tabulated results showed mean Pb contents of 0.04 p.p.m. (fresh wt.) in the muscle of animals from both countries, 0.89 and 0.27 p.p.m. resp. in the liver, 0.37 and 0.18 p.p.m. in the kidneys, Cd contents of 0.13 and 0.15 p.p.m. in muscle, 9.12 and 7.06 p.p.m. in liver and 43.49 and 57.59 p.p.m. resp. in the kidneys of animals from Germany and Poland resp. Assuming a tolerable weekly Cd intake from food of 0.4-0.5 mg, horsemeat would provide critically high levels. It is recommended that horse livers and kidneys be declared unfit for human consumption, and horsemeat analysed for Cd. RM

## 5

[Significance of Pb in environmental contamination in Umbria, Italy.]
Begliomini, A.; Morcellini, M.; Morozzi, A.
***Archivio Veterinario Italiano*** 30 (1/2) 24-27 (1979) [9 ref. It, en] [Inst. Zooprofilattico Sperimentale dell'Umbria & delle Marche, Perugia, Italy]

Pb was determined by AAS in numerous samples of foods and feeds collected in the Italian provinces of Terni and Perugia. Tables of results are given. Mean values (in p.p.m.), with numbers of samples in parentheses, were: bovine blood (26) 0.19; cows' milk (18) 0.09; whole egg (16) 1.05; egg yolk (8) 2.37; egg white (8) 0.47; bovine muscle (2) 1.54; bovine liver (2) 2.26; bovine kidney (2) 2.63; porcine liver (5) 1.54; turkey liver (1) 1.50; duck muscle (10) 1.42; duck liver (10) 1.61; duck kidney (10) 2.42; chicken liver (25) 1.24; chicken kidney (10) 1.61; trout muscle (2) 1.56; mussels (4) 0.99; and snails (9) 2.20. AJDW

## 6

**[Evaluation of contamination of foods with heavy metals.]**
Angelucci, E.
***Boletim do Instituto de Tecnologia de Alimentos, Brazil*** No. 60, 91–98 (1978) [11 ref. Pt, en] [Inst. de Tecnologia de Alimentos, Campinas, Sao Paulo, Brazil]

Cu, Sn, Pb and Hg were determined in various commercial canned foods, samples collected in Campinas on 3 dates (at 6-month intervals) in 1977–1978 being studied. 2 brands of each product type except passion fruit juice were tested. A table of results is given. Max. values recorded for Cu, Sn, Pb and Hg in each product were, resp.: sardines, 10 mg/kg, 128 mg/kg, 80 μg/kg and 120 μg/kg; tuna, 6 mg/kg, 114 mg/kg, 89 μg/kg and 396 μg/kg; Vienna sausages, 4 mg/kg, 67 mg/kg, 71 μg/kg and 40 μg/kg; tomato paste, 18 mg/kg, 71 mg/kg, 59 μg/kg and 25 μg/kg; liver pate, 14 mg/kg, 82 mg/kg, 66 μg/kg and 40 μg/kg; conc. orange juice, 8 mg/kg, 78 mg/kg, 45 μg/kg and 52 μg/kg; and passion fruit juice 9 mg/kg, 103 mg/kg, 43 μg/kg and 31 μg/kg. Concn. of Cu were below Brazilian and Codex Alimentarius max. limits, except for 1 sample of tomato paste. Sn and Pb concn. in all samples were below the max. limits. The sardine and tuna samples had Hg concn. below the max. limit of 0.5 p.p.m. for these products; however, most of the other samples had Hg concn. exceeding the Brazilian tolerance of 0.01 p.p.m. AJDW

## 7

**[Square-wave polarographic determination of tin in canned products.]** Bestimmung des Zinngehalts in Erzeugnissen der Konservenindustrie mittels Square-wave-polarographischer Methode.
Borus-Böszörmenyi, N.; Schoket, B.
***Nahrung*** 23 (5) 539–549 (1979) [31 ref. De, en, ru] [Central Authority for Food Control & Chem. Examination, Min. for Agric. & Nutr., Budapest, Hungary]

A 2.5 g sample of the food under test is wet-ashed with 2.0 ml conc. $H_2SO_4$; the vol. of the resulting solution is made up to 25 ml. The optimum $H_2SO_4$ concn. in the electrolyte solution may be achieved by addition of 2 vol. of 1:1 diluted HCl to 10 ml ashing solution. Trials showed that Sn can be determined over the range 5–400 μg/g with a relative error of ±5%. Studies were conducted on detn. of Sn in the presence of Pb. No interference occurs at a Sn:Pb ratio of 4:1; at Sn:Pb ratios of 2:1 or 1:1, supplementary detn. of Pb (in $H_2SO_4$ electrolyte) is necessary. Comparative studies between this method and a spectroscopic method using phenylfluorone reagent were conducted on 3 samples of liver pate and 20 samples of canned vegetables; results determined by the 2 methods did not differ significantly. IN

## 8

**[Simultaneous inverse-voltammetric determination of cadmium, lead and copper in dried milk.]** Zur simultanen invers-voltammetrischen Bestimmung von Cadmium, Blei und Kupfer in Milchpuder.
Fariwar Mohseni, M.; Neeb, R.
***Zeitschrift für Analytische Chemie*** 296 (2/3) 156–158 (1979) [11 ref. De, en] [Johannes-Gutenberg-Univ., D-6500 Mainz, Postfach 2980, Federal Republic of Germany]

The conditions for dry ashing decomposition and inverse differential pulse voltammetry for the simultaneous estimation of Cd, Pb and Cu in dried milk are described. Analysis of a commercial sample of skim milk (ash content 8% on DM) gave the following results (μg/kg): Cd 0.78 ± 0.05, Cu 134.3 ± 8.5, Pb 20.5 ± 0.8. Analysis of 4 samples (3 replicates, ash content 7.5% on DM) gave mean values (μg/kg, ± relative s.d.): Cd 1.1 ± 12%, Pb 17 ± 6%, Cu 81.6 ± 7%. RM

## 9

**Heavy metal residues in dulse, an edible seaweed.**
Sirota, G. R.; Uthe, J. F.
***Aquaculture*** 18 (1) 41–44 (1979) [4 ref. En] [Tech. Branch, Halifax Lab., Fisheries & Oceans Canada, PO Box 550, Halifax, Nova Scotia, B3J 2S7, Canada]

Dulse (*Palmaria palmata* Guiry, formerly *Rhodymenia palmata)* is dried and consumed as a relatively common snack food on the east coast of N. America. Duplicate samples of dulse harvested from 3 geographically different areas (Dark Harbour and Front Island on Grand Manan Island, and Maces Bay on the mainland of New Brunswick) and a common holding tank were analysed for As, Cu, Cd, Pb, Se, Zn and Hg by flameless AAS. Concn. ranges (μg/g dry wt.) were: As 5.50–7.50, Cu 3.90–6.34, Cd 0.97–2.65, Pb 0.688–3.50, Se 2.00–2.91, Zn 57.5–84.1, and Hg <0.02. Moisture content ranged from 10.44 to 13.72%. Dulse appeared to be able to concentrate metals, with accumulation coeff. of 200 for Cu, 10 000 for Zn, and 3000 for As. AL

## 10

**[Application of wavelength-dispersive X-ray fluorescence spectrometry in analysis of trace elements in foods.]** Anwendung wellenlängendispersiver Röntgenfluoreszenz-Spektrometrie in der Spurenanalytik von Lebensmitteln.
Grote, B.; Montag, A.
***Lebensmittelchemie und Gerichtliche Chemie*** 33 (5) 89–92 (1979) [10 ref. De] [Univ. Hamburg, Grindelallee 117, 2000 Hamburg 13, Federal Republic of Germany]

After a brief consideration of the basic principles of wavelength dispersive X-ray fluorescence spectrometry, a procedure for detn. of heavy metals in foods is described based on ashing the sample at 450°C, dissolving the ash in conc. HCl, reduction of $Fe^{3+}$, elimination of phosphate by precipitation with $ZrOCl_2$, adjustment of the solution to pH 4, precipitation of heavy metals by means of sodium diethyl dithiocarbamate, and analysis of the precipitate by X-ray fluorescence spectrometry. Data are given for concn. of Co, Cu, Cd, Ni, Zn, Fe and Pb, determined by this technique, in samples of various fruit, vegetable, meat or milk-based foods for infants, and for cinnamon, juniper berries, caraway seeds, cloves and parsley. Reproducibility was good, coeff. of variation ranging from 1.57% for Co to 7.5% for Pb. Detection limits for individual elements were (μg): Co 0.69; Ni 0.45; Cu 4.88;

Zn 14.42; Fe 18.45; Cd 0.10; and Pb 1.00. Interference between individual trace elements was negligible., AJDW

## 11

**[Swiss food handbook. Instalment 16.]** Schweizerische Lebensmittelbuch. 16. Lieferung. [Book]
**Switzerland,** Schweizerische Lebensmittelbuchkommission; **Switzerland,** Eidgenössische Gesundheitsamt
69pp. (1979) [De] Berne, Switzerland; Drucksachen- & Materialzentrale

This 16th installment of this loose-leaf handbook comprises Chapter 45, Heavy metals. It covers analytical methods (including AAS, polarographic and photometric techniques) for detn. of heavy metals, including As, Sb, Ba, Pb, Cd, Cr, Cu, Ni, Hg, Se, Th, Bi, Zn and Sn. Methods for ashing of the food sample under test are also given. A subject index is included. [See FSTA (1979) 11 8A580 for the previous part.] AJDW

## 12

**[A pressure decomposition device for fast treatment of large amounts of biological and organic matter and its application to the determination of trace quantities of heavy metals.]**
Druckaufschlusseinrichtung für die schnelle Aufbereitung von grösseren Substanzmengen aus Biomaterialien und organischen Substanzen zur analytischen Erfassung von Schwermetallspuren.
Scheubeck, E.; Gehring, J.; Pickel, M.
***Zeitschrift für Analytische Chemie*** 297 (2/3) 113–116 (1979) [7 ref. De, en] [Siemens AG, Postfach 3240, D-8520 Erlangen, Federal Republic of Germany]

A cylindrical pressure vessel with fast safety lock was used in a pressure decomposition apparatus developed for rapid combustion of biological samples (up to 20 g) in $O_2$. The construction and chemical resistance of the material allow high recovery rate of Hg, As, Cd and Pb at 50–250 ng/g from meat, dairy products, vegetables and fats. The equipment is easy to handle and needs only cooling water and electric power supply. The principle, construction and operation are described, but no results of detn. are given. RM

## 13

**Application of independent methods and standard materials: an effective approach to reliable trace and ultratrace analysis of metals and metalloids in environmental and biological matrices.**
Stoeppler, M.; Valenta, P.; Nürnberg, H. W.
***Zeitschrift für Analytische Chemie*** 297 (1) 22–34 (1979) [68 ref. En, de] [Inst. of Chem., Nuclear Res. Cent., PO Box 1913, D-5170 Jülich, Federal Republic of Germany]

The development of independent analytical procedures or working standards and standard reference materials for trace analysis is discussed. The application of independent methods for detn. of Pb, Cd, Cu, Ni and Hg in natural waters and biological samples (including fish muscle and wine) and the current use of the NBS standard reference materials bovine liver and orchard leaves is described. Data from long-term storage studies of blood samples, and results of trace metal detn. in 2 working standards (fish muscle homogenate and algae) and in tentative future standard reference materials (dried whole blood, blood plasma, phytoplankton, human hair, 2 aquatic and 1 terrestrial plant material) are presented in tables. RM

## 14

**[Migration of lead, cadmium, copper, zinc and antimony from porcelain vessels.]**
Zawadzka, T.; Brzozowska, B.
***Roczniki Panstwowego Zakladu Higieny*** 30 (2) 115–122 (1979) [4 ref. Pl, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku Panstwowego Zakladu Higieny, Warsaw, Poland]

The aim of the study was detn. of the degree of migration of Pb, Cd, Zn, Cu and Sb from porcelain tableware (dishes) with interior decorations. The investigations were carried out on dishes produced by 7 different manufacturers representing a broad range of decorative paintings. Results showed that Pb migrated in greatest amounts into 4% acetic acid during 24 h at room temp.; in about 90% of vessels tested Pb content was in the range 0–3 mg/l of postextraction fluid, with a max. of 20 mg/l. Cd migration was in the range 0–0.3 mg/l; Zn, Cu and Sb migrated in trace amounts, the highest values of these metals being 1.6, 0.1 and 0.1 mg/l resp. AS

## 15

**Binding forms of toxic heavy metals, mechanisms of entrance of heavy metals into the food chain, and possible measures to reduce levels in foodstuff.**
[Review]
Lorenz, H.
***Ecotoxicology and Environmental Safety*** 3 (1) 47–58 (1979) [82 ref. En] [Zentrale Erfassungs- & Bewertungsstelle für Umweltchemikalien des Bundesgesundheitsamtes, 1000 Berlin 33]

Chemical spp. of Hg, Cd and Pb occurring in the environment and the routes of entry of bound forms of these metals into human food are reviewed. Measures for reduction of heavy metal content of food are suggested, including choice of suitable substrate for mushroom growth to avoid high contents of Hg and Cd, adjustment of soil pH to control plant Pb uptake, and reduction of Cd content in effluents to reduce contamination of sea food. DIH

## 16

**[Tin and lead in imported preserves.]**
Blanche, U.
***Livsmedelsteknik*** 21 (2) 68–69 (1979) [Sv]

268 samples of canned fruit, 110 of canned vegetables and 72 of 'other' canned foods imported into Sweden were analysed for Pb contents, and 337, 165 and 72, resp., for Sn contents. Results are tabulated, covering % distribution by concn. found and mean actual values within these categories. 4% of the samples had Pb contents above the Swedish standard (currently

2 mg/kg, earlier 3 mg/kg), and 2% Sn concn. above the standard (250 mg/kg). HBr

## 17

**Relationship of blood lead in women and children to domestic water lead.**
Thomas, H. F.; Elwood, P. C.; Welsby, E.; St. Leger, A. S.
*Nature, UK* 282 (5740) 712–713 (1979) [9 ref. En] [Med. Res. Council Epidemiology Unit, Cardiff, UK]

It is generally accepted that food and drink are the major sources of body Pb. On average, Pb from water contributes markedly less to total intake than does food, except when average Pb in water is $>0.1$ mg/l. The water supply of 2 adjacent council housing estates in a small Welsh rural town, with either Cu or Pb piping, was sampled at 3 stages: (i) first flush of water in the morning, (ii) 'daytime', first water from tap at the time of visit, and (iii) 'running', after running water for 5 min after (ii). Range and medium Pb levels in water for the 2 estates and blood Pb levels for children and adult females are shown in a table. Removal of Pb water pipes produced a drop of approx. 50% in mean blood Pb levels, to levels comparable to those in the Cu-piped estate. AL

## 18

**[Pb content of drinking waters in La Coruna, Spain.]**
Bermejo Barrera, A.; Pilar Bermejo Barrera, M. del; Bermejo Martinez, F.
*Tecnica Investigacion y Tratamiento del Medio Ambiente* 1 (2) 24–41 (1979) [22 ref. Es, en, pt] [Dep. de Quimica Analytica, Fac. de Quimica, Santiago de Compostela, Spain]

Pb was determined by a dithizone spectrophotometric method in 235 samples of drinking water from various locations in the province of La Coruna, Spain, samples taken at various times of day from wells or piped water supplies (including samples from iron and from lead piping systems) during the period Jan. 1977–Jan. 1978 being studied. Tables of results are given. Pb concn. recorded ranged from 0 to 2.50 p.p.m. Most water samples had very low Pb concn.; 61.28% of samples had Pb concn. $<0.05$ p.p.m., the limit specified by the USA Public Health Service. Data are also given for the hardness and the corrosive activity of 20 water samples. The danger of uptake of Pb by water in lead pipes is briefly considered. ADJW

## 19

**[Lead content of Trentino-Alto Adige wines.]**
Stefani, R.
*Vini d'Italia* 20 (117) 343–345 (1978) [10 ref. It, fr, en, de] [Lab. di Analisi e di Ricerca, Istituto Agrario Provinciale, S. Michele all'Adige, Trento, Italy]

Mean value with s.d. (and other statistice) for Pb contents (AAS) of 302 samples of Trentino-Alto Adige wines, was 0.133 ± 0.07 (range, 0.040–0.481) mg/l, vs. 0.208 ± 0.119 (range 0.061–0.820) mg/l for 55 other Italian red wines [see FSTA (1976) 8 10H1725]. Only 3.3% of the Trentino wines exceeded the legal limit vs. 18.5% for the other wines. SKK

## 20

**Translocation and accumulation of seven heavy metals in tissues of corn plants grown on sludge-treated strip-mined soil.**
Garcia, W. J.; Blessin, C. W.; Sandford, H. W.; Inglett, G. E.
*Journal of Agricultural and Food Chemistry* 27 (5) 1088–1094 (1979) [16 ref. En] [N. Regional Res. Center, USDA, Peoria, Illinois 61604, USA]

Corn (*Zea mays*) plants were grown on unamended soil on strip-mined land (original top soil displaced) and on soil amended by addition of anaerobically digested sewage sludge (25 t dry wt./acre). Contents of 7 metals in the 2 soils are tabulated. Soil pH was 7.4. Tabulated results show effect of sludge addition and of plant size on contents of these metals in various plant tissues (kernels, roots, leaves etc.) after harvest. No metal was accumulated in excessive quantities in kernels, which were considered safe for consumption from either soil. Ratios of contents in kernels from sludge-grown plants:contents in those from unamended soil were as follows: Cd 0.44, Pb 0.56, Cu 0.66, Zn 0.84, Cr 1.24, Mn 1.25 and Hg 3.16. Highest metal concn. were observed in leaves and roots, lowest concn. in cobs and kernels. Sludge-grown roots were unsuitable for animal feeding. DIH

## 21

**[Total content of Hg, Pb, Cd and Cr in the fauna and flora of the S. Gilla lagoon, Cagliari, Italy. Preliminary note.]**
Arru, A.; Balestrieri, F.; Chiacchierini, E.; Magri, A. L.; Panzanelli, A.
*Rivista della Societa Italiana di Scienza dell'Alimentazione* 8 (3) 211–216 (1979) [20 ref. It] [Istituto di Zoologia, Univ. di Sassari, Sassari, Italy]

Data are given for concn. of Pb, Cd, Cr and Hg (determined by AAS) in samples of marine animals and seaweeds from the S. Gilla lagoon, which is polluted with domestic and industrial effluents. Values are included for the fish *Liza saliens, Atherina boyeri,* mullet *(Mugil cephalus),* eel *(Anguilla anguilla),* sole *(Solea vulgaris),* and bass *(Dicentrarchus labrax),* the molluscs carpet shell *(Tapes decussatus)* and mussel *(Mytilus galloprovincialis),* the crustacea shore crab *(Carcinus mediterraneus)* and common prawn *(Leander serratus),* and the seaweed *(Ulva lactuca).* Max. values recorded for the heavy metals studied were: Pb 70.0 p.p.m. (dry wt. basis) in shore crabs; Cd 5.00 p.p.m. dry wt. basis in shore crabs; Cr 13.0 p.p.m. wet wt. basis in carpet shell; and Hg 5.70 p.p.m. wet wt. basis in shore crabs. AJDW

## 22

**Lead in food; advance notice of proposed rulemaking: request for data.**
**United States of America, Food & Drug Administration**
*Federal Register* 44 (171, Aug. 31) 51233–51242 (1979) [En] [Washington, DC, USA]

Sources of Pb in the food supply, health concerns including carcinogenicity, and efforts to reduce Pb entering food from Pb-soldered cans, are reviewed. The long-range goal is to reduce Pb intake from all sources – air, $H_2O$, and food – to $<100$ g/day for children 1–5 yr old. CAS

## 23

**Lead in Danish food-stuffs.**
Solgaard, P.; Aarkrog, A.; Fenger, J.; Flyger, H.; Graabaek, A. M.
***Danish Medical Bulletin*** 26 (4) 179–182 (1979) [20 ref. En] [Riso Nat. Lab., DK-4000 Roskilde, Denmark]

A long-term study (1962–1976) of the Pb content of food has been performed using samples of Danish food substances collected annually at the Riso National Laboratory. Samples so far investigated are: 150 samples of dried milk from 7 factories; 500 samples of Danish cereals (spring and winter wheat, *Triticum vulgare*, and barley) from 10 of the state experimental farms; and 70 samples of total diet collected in 8 areas covering all of Denmark. Pb concn. in the ash of dried milk varied from 13 to $<0.1$ p.p.m. Significant differences were observed in the Pb content in the dried milk from different factories, and in some cases, temporal variations also occurred. It was not possible to demonstrate a general time trend. The dried milk samples did not exhibit a remarkable Pb content, and since the manufacturing process and/or the packing appeared to have a significant effect these samples were not suitable for the purpose of the study. The results show a decrease in the Pb content in wheat of about 75% and in barley and total diet of about 50% in the period 1962–1976. VJG

## 24

**Lead – a weighty problem.**
Hawkins, R.
***Food and Cosmetics Toxicology*** 17 (2) 171–174 (1979) [8 ref. En] [British Ind. Biol. Res. Ass., Woodmansterne Road, Carshalton, Surrey, UK]

Recent literature on the hazard of Pb to man is briefly reviewed with particular reference to atmospheric concn. of Pb in urban areas, and absorption and excretion of Pb. VJG

## 25

**[1979 standard values for lead, cadmium and mercury in and on foods.]** Richtwerte '79 für Blei, Cadmium und Quecksilber in und auf Lebensmitteln.
Anon.
***Bundesgesundheitsblatt*** 22 (15) 282–283 (1979) [1 ref. De]

Figures are presented relating the standard values for heavy metals in a range of foods and beverages, including: milk, various meats, fruits and vegetables, drinking water and wine. The tables also show sample size, range of analytical values, mean values and % sample less than the standard level for detn. of each of the metals in the various foodstuffs. [See FSTA (1979) 11 3U124 for 1976 standards.] JRR

## 26

**Residues of lead in edible tissues or products of cattle and swine after low-level exposures.**
Sharma, R. P.; Street, J. C.; Shupe, J. L.; Wagstaff, D. J.
***Toxicology and Applied Pharmacology*** 41 (1) 150–151 (1977) [En] [Utah State Univ., Logan, Utah, USA]

Cows and pigs were treated with lead acetate (added to the diet at levels approximating 5 and 25 p.p.m. Pb above the normal dietary intake) for 3 months; some of the animals were then fed a control diet to allow depletion of any accumulated metal. Flameless AAS was used to determine Pb in the muscle, liver and bone of the cows and pigs and in cows' milk. No increase in the Pb concn. occurred in milk from cows fed the diet with 5 p.p.m. added Pb, while the Pb level in milk from cows fed the higher Pb diet increased significantly (60 parts/billion vs. 10 parts/billion for controls); however, such increased Pb levels are lower than those often reported for processed milk. Muscles did not show any increase in Pb levels (mean values 20–60 parts/billion). Pb concn. in liver showed a dose-dependent increase but levels fell rapidly during a 3-month depletion phase. On the basis of the results obtained, it is concluded that the dietary treatments studied may not lead to a substantial increase in the dietary intake of Pb by humans. JA

## 27

**[Can tinfoil caps influence the lead content of wines?]** Können Stanniolkapseln den Bleigehalt der Weine beeinflussen?
Weger, B.
***Wein-Wissenschaft*** 34 (1) 61–67 (1979) [13 ref. De]

Examination of the tinfoil ('Stanniol') caps for wine-bottles (6 from the Federal Republic of Germany, 8 from Italy, and 6 of unknown origin) showed that they were composed mostly of Pb (range, 93.0–99.2%) with a small admixture of Sn (0.6–6.1%). Tests showed that 100 ml wine (pH 3.35) dissolved Pb readily from 2 $cm^2$ of a cap, Pb content increasing from 0.22 p.p.m. initially to 0.99 in 10 days and 2.49 p.p.m. in 20 days. However, examination of 5 South-Tyrol wines stored from 1959–1966 to date in corked bottles with tinfoil caps showed a Pb content ranging from 0.06 to 0.28 mg/l. It is therefore concluded that tinfoil caps can cause Pb uptake by wine only if the cork is faulty, and that no objections should be raised to this traditional method of presentation of bottled wines. SKK

## 28

**[Lead contamination of wines produced in the province of Rome.]**
Bolasco, A.; Gallo, S.; Memoli, A.; Rodriguez Eiras, L. E.
***Farmaco, Edizione Pratica*** 34 (3) 95–106 (1979) [15 ref. It, en] [Univ. degli Studi di Roma, Rome, Italy]

Pb pollution was determined in leaves, grapes and wines from the province of Rome. Tabulated results showed Pb contents (in p.p.m.) of 1.8–5.4 in the leaves, 0.32–0.60 in the grapes, 0.07–0.20 in home-made wines, 0.08–0.72 in wines from small-scale production (4 samples out of about 60 with $>0.30$), and 0.10–0.40 (only 1 sample $>0.30$) in 30 industrially-produced wines. RM

## 29

**[Changes in the content of lead, cadmium and mercury in vegetables as a result of domestic preparation.]** Veränderung der Gehalte von Blei, Cadmium und Quecksilber in Gemüsen bei der haushaltsüblichen Zubereitung.
Schelenz, R.; Boppel, B.; Zacharias, R.; Fischer, E.
*Berichte der Bundesforschungsanstalt für Ernährung* No. 1, 94pp. (1979) [28 ref. De, en] [Zentrallab. für Isotopentech., Bundesforschungsanstalt für Ernährung, Karlsruhe, Federal Republic of Germany]

186 samples of various vegetables (cauliflower, kohlrabi, French beans, carrots, Brussels sprouts, potatoes, and savoy cabbage) were used in a study on effects of domestic-style processing on contents of Hg, Pb and Cd. Hg was determined by neutron activation analysis; Pb and Cd were determined by AAS. Effects of trimming, washing, peeling (as appropriate) and boiling or steaming on heavy metal concn. were studied. Numerous tables of data are given showing Pb, Hg and Cd concn. in the vegetables at each stage of processing, in the water and NaCl used in cooking, and in the peeling wastes, etc. The results are discussed in detail. Overall, trimming, washing and peeling reduced Pb and Hg concn. of the vegetables by approx. 50%; little further reduction in concn. of these 2 metals occurred during cooking. Cd concn. decreased by only approx. 7% as a result of domestic-style preparation. No significant effect of the added NaCl on heavy metal concn. is likely; the water used for cooking of vegetables might influence Hg concn., but is unlikely to influence Pb or Cd concn. AJDW

## 30

**Trace metal contamination of soils and vegetables in Shipham, Somerset.**
Davies, B. E.; Ginnever, R. C.
*Journal of Agricultural Science, UK* 93 (3) 753-756 (1979) [5 ref. En] [Dep. of Geography, Univ. Coll. of Wales, Aberystwyth, Dyfed, SY23 3DB, UK]

Samples of top soil and vegetables (potatoes, Brussels sprouts and parsnips or swedes) were collected from 7 gardens in Shipham (an area mined in the past for Zn) and from a control garden in Compton Dundon, Somerset, and analysed for trace metal content (Pb, Zn, Cu, Cd and Ag). Results are shown in tables. The mean soil Pb content in Shipham was 30 × that of the control garden, and the corresponding ratios for potatoes, root crops and sprouts were 2.2, 2.3 and 8.2 resp.; corresponding figures for Cd were 35 ×, 5.3, 3.4 and 6.6 For Pb, Zn and Cd their availability increased in the order potatoes < roots < sprouts whereas the reverse order was observed for Cu. Ag normally occurs in plants at concn. below the detection limit of flame absorption spectrophotometry, but in several cases the concn. in Brussels sprouts were high, and similar to Cd. AL

## 31

**[Uptake of lead, cadmium and mercury by cultivated mushrooms.]** Zur Blei-, Cadmium- und Quecksilber-Aufnahme in Kulturchampignons.
Enke, M.; Roschig, M.; Matschiner, H.; Achtzehn, M. A.
*Nahrung* 23 (7) 731-737 (1979) [15 ref. De, en, ru] [Bezirks-Hygieneinspektion & -inst., Halle, German Democratic Republic]

Studies on uptake of Pb, Cd and Hg by cultivated mushrooms *(Agaricus bisporus)* grown in media enriched with these heavy metals are described. Pb content of the mushrooms was not influenced by the Pb content of the growth medium; it is therefore concluded that Pb in mushrooms is largely attributable to air pollution. Accumulation of Cd and Hg by the mushrooms increased with increasing concn. of these elements in the growth medium, the correlations between concn. in mushrooms and in the corresponding growth medium being significant. The Cd concn. of the mushrooms decreased in successive harvests from the same batch of growth medium; this effect was not observed for Hg. IN

## 32

**[Studies on the accumulation of trace elements in fish. IV. Accumulation of selenium and mercury in various tissues of tuna.]**
Nishigaki, S.; Tamura, Y.; Maki, T.; Shimamura, Y.; Naoi, Y.
*Annual Report of Tokyo Metropolitan Research Laboratory of Public Health* 28 (1) 140-144 (1977) [13 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Mean concn. and ranges of muscle and internal organs contents of Se, Hg, As, Cd, Pb, Cu, Zn are tabulated (in En) for sweet smelt, trout, rainbow trout and pond smelt and for 2-3 locations in Japan. Se concn. were not related to size or sp. of fish or location. Tissue distributions, including white and dark muscle, of the same elements are tabulated for catfish, carp and crucian carp. Contents of Se and Hg in catfish were (p.p.m.): white muscle 0.11-0.15, 0.21-0.44; dark muscle 0.11, 0.22-0.43, resp. Overall mean Se content in muscle was 0.16 ± 0.04 p.p.m. Accumulation of Mg increased with growth; no other pattern of accumulation was discernible. [From En summ] [See FSTA (1977) 9 2R56 for part III.] DIH

## 33

**[Contents of trace elements in shells of short-necked clam in Tokyo Bay.]**
Yasuno, T.; Ogino, S.; Ono, A.; Ohata, T.; Endo, F.
*Annual Report of Tokyo Metropolitan Research Laboratory of Public Health* 28 (1) 156-162 (1977) [16 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Trace elements were determined by AAS, in 22 samples of short-necked clam taken from 5 sampling locations in Tokyo Bay, during May-Sept. AAS conditions and results for each sample are tabulated in En. Mean contents were (p.p.m.); As 0.085, Cd 0.09, Pb 0.18, Cu 1.24, Cr 0.022, Zn 3.73, Fe 32.5, Mn 16.2, Mg 157, Sr 1496 and total Hg 0.034. Significant differences between sampling locations were noted for Pb, Cu, Zn, Fe and Sr. [From En summ.] DIH

## 34

**Influence of water-borne and dietary calcium on uptake and retention of lead by coho salmon (*Oncorhynchus kisutch*).**
Varanasi, U.; Gmur, D. J.
***Toxicology and Applied Pharmacology*** 46 (1) 65–75 (1978) [29 ref. En] [Environmental Conservation Div., Northwest & Alaska Fisheries Cent., 2725 Montlake Boulevard East, Seattle, Washington 98112, USA]

Several studies were conducted, involving: (i) immersion of salmon in water containing 0.21 p.p.m. Pb and normal (2.6 p.p.m.) or increased (6.2 p.p.m. of additional Ca) Ca levels for 168 h, followed, in some cases, by depuration in water containing 2.6 or 9.8 p.p.m Ca; (ii) force-feeding with gelatin capsules containing 8.4 mg Ca, followed by immersion in water containing 0.13 p.p.m. Pb and, in some cases, by a repeat of the force-feeding treatment; (iii) injection via the caudal vein with 20 ± 2 µg lead nitrate followed by immersion in water containing 2.6 or 11.9 p.p.m. Ca. Pb uptake and retention were determined in salmon from all 3 studies. The tissues analysed included gills, blood, liver, brain, skin, skeleton and kidney. Results demonstrated that increased Ca concn., either in water or food, reduce the uptake of water-borne Pb by coho salmon. However, increased Ca levels in the water did not significantly reduce the retention of intravenously injected Pb in salmon tissues. Pb was found to be bioconcentrated to a similar extent in the skin and skeleton of Pb-treated fish. It is concluded that in salmon the biological fate (and presumably the toxicity) of Pb is influenced by the Ca status of the fish. JA

## 35

**[Study of trace elements in marine fish. III. Distribution of arsenic and heavy metals in seabass tissue.]**
Yasuda, K.; Katsuki, Y.; Ueda, K.; Noai, Y.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** 28 (1) 121–126 (1977) [24 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

39 seabass 42–70 cm in length were caught at various locations off Japan and contents of heavy metals in muscle and internal organs were determined. Mean concn. (p.p.m. wet basis) in muscles were: methylmercury 0.23, total Hg 0.28, As 0.41, Cd <0.01, Pb 0.04, Zn 4.5, Cu 0.25, Co 0.02, Cr 0.02 and Mn 0.04. Cd concn. was lower, and Pb higher, than that in bonito tissue [see Part II, FSTA (1977) 9 2R55]. Hg tended to accumulate in muscle rather than viscera. A separate study of young fish showed that total Hg concn. in muscle increased with body length, from 0.01 to 0.03 p.p.m. with corresponding increase in length from 5–9 cm to 34 cm. As concn. was unaffected by length. There were no significant differences among the 39 mature seabass in heavy metal content with regard to location. [From En summ.] DIH

## 36

**Biochemistry of selected heavy metals in Western Port, Victoria, and use of invertebrates as indicators with emphasis on *Mytilus edulis* planulatus.**
Harris, J. E.; Fabris, G. J.; Statham, P. J.; Tawfik, F.
***Australian Journal of Marine and Freshwater Research*** 30 (2) 159–178 (1979) [36 ref. En] [Marine Chem. Unit, Min. for Conservation, 7b Parliament Place, E. Melbourne, Victoria 3002, Australia]

The relations of Cd, Cu, Fe, Mn, Pb and Zn concn. in sediments, seagrasses and several invertebrates with the geological source areas in the W. Port catchment were examined and shown with the aid of maps. Highest Cd, Fe and Pb levels were in mussels on the E. side. Concn. in a composite sample from the lower N.W. arm segment were 0.132, 5.22, 39.2, 0.881, 0.302 and 26.1 µg/g fresh wt. resp. Freeze drying reduced Fe concn. by 6.9% (to 36.5 mg/g fresh wt. equivalent) and Pb concn. by 3.7% (to 0.189), but had no significant effect on the other metals. Cd, Zn and water contents increased linearly with shell length, Mn concn. decreased, Pb and Fe data could not be fitted with a linear equation. Concn. of Cd, Fe and Pb appeared to be directly related to detritus derived from seagrass meadows, Zn concn. to both detritus and man's activities. RM

## 37

**[The effects of increasing Pb doses on the performance of fattening pigs and on the carry-over of Pb in several tissues. I. Performance of animals and slaughter results.]** Untersuchungen über den Einfluss von Bleizulagen auf die Entwicklung von Mastschweinen und auf die Rückstandsbildung in verschiedenen Geweben. I. Entwicklung der Tiere und Schlachtbefunde.
Petersen, U.; Vemmer, H.
***Landwirtschaftliche Forschung*** 32 (3) 316–325 (1979) [7 ref. De, en]

100 fattening pigs were given Pb supplements of 0.03–614 mg/kg air-dry feed. The basic content of the diet was 2.0 mg Pb/kg. There were no significant Pb-related effects on feed intake, growth and feed conversion ratio, though the 3 highest Pb levels (156–614 mg/kg) showed a trend towards reduced performance. Carcass characteristics were not affected by the Pb doses. Doses of ≥ 156 mg/kg resulted in significant enlargement of the kidneys. The mass of heart, liver, spleen and thyroid gland was not affected. [From En summ.] RM

## 38

**[Changes in the specific $^{210}$Pb activity during passage from the feed to the skeleton of slaughtering beef.]** Untersuchungen über Veränderungen der spezifischen Blei-210-Aktivität beim Übergang aus dem Futter in das Skelett von Schlachtrindern.
Mirna, A.; Kreuzer, W.; Hecht, H.; Glabasnia, B.
***Archiv für Lebensmittelhygiene*** 30 (4) 143–146 (1979) [13 ref. De, en] [Inst. für Hygiene & Tech. der Lebensmittel Tierischen Ursprungs, Veterinärstrasse 13, 8000 Munich 22, Federal Republic of Germany]

The transfer of stable Pb and radioactive $^{210}$Pb from the feed into bones was studied by determining the specific $^{210}$Pb activity in the feed and in caudal vertebrae of beef carcasses. Samples of feed and caudal vertebrae from an area of low Pb contamination (Kulmbach) showed significantly higher activity (mean 391 and 228 × $10^3$ pCi $^{210}$Pb/g Pb resp.) than those from an area with high pollution (Meckernich; 8.4 and 20.0 × $10^3$ pCi $^{210}$Pb/g Pb). With increasing age, the specific Pb activity fell to about half the levels found in younger animals (<18 months). RM

## 39

**Lead testing method simplifies sample handling.**
Anon.
***Food Product Development*** **13 (5)** 85 (1979) [En]

A streamlined method of determining Pb in foods, developed by the National Food Processors Association, uses a single volumetric flask for sample preparation and is sensitive to 6 parts/billion using AAS. For canned foods the procedure involves emptying the entire contents into a suitable container, preferably plastics, adding an equal amount of conc. nitric acid and allowing to stand overnight. Fresh foods are blended thoroughly before being treated. 5 g of the food is placed in the flask. Foods which are difficult to digest (fatty materials) are treated with 10 ml of conc. nitric acid plus 2 ml of sulphuric-perchloric acid mixture. Simpler foods are digested with 5 ml of conc. $HNO_3$ plus 2 ml of conc. $H_2SO_4$. Place flasks on a hot plate, heat until white fumes appear, turn heat high and continue heating until no more white fumes are present and the material in the flask is clear. Allow flasks to cool, add 10 ml of 15% $H_2SO_4$ and add water to approx. 50 ml. Prepare a series of Pb standards. Add 2 ml of xylene-diethyldithiocarbamic acid solution to each of the flasks, shake for 3 min, and add water to bring the xylene phase up into the neck of the flask. Adjust the spectrophotometer using the 283.3 lead wavelength. Aspirate both Pb standards and unknowns within 1 h of addition of xylene solution, and determine Pb concn. in unknowns by comparing to the standard curve obtained from the Pb standards. VJG

## 40

**[Toxic metals in the human environment – the role of foods of animal origin.]** Toxische Metalle in der Umwelt des Menschen – die Rolle von Nahrungsmitteln tierischer Herkunft. [Review]
Käferstein, F. K.; Klein, H.; Lorenz, H.; Müller, J.; Schmidt, E.; Wosing-Narr, V.
***Tierärztliche Umschau*** **34 (7)** 468, 471–473 (1979) [many ref. De, en] [ZEBS, Bundesgesundheitsamt, Postfach, D-1000 Berlin 33]

This lecture reviews the importance of toxic metals in the industrial society, sources and pathways of contamination of plant and animal foods, effects of food processing, probable daily intake in the Federal Republic of Germany and WHO provisional tolerable weekly intakes of Pb, Cd and Hg. RM

## 41

**[Hygienic evaluation of metallic items intended for contact with food.]**
Pestova, A. G.
***Gigiena i Sanitariya*** **No. 12,** 22–26 (1979) [9 ref. Ru, en] [Vses. Nauchno-issled. Inst. Gigieny i Toksikologii Pestitsidov, Polimernykh i Plasticheskikh Mass, Kiev, USSR]

In view of potential migration as a result of contact between foods and metal surfaces (e.g. machinery), migration of Al, Mg, Zn, Cu, Pb or Mn from various commercial types of aluminium, brass, bronze, steel and titanium into model solutions after 10 or 60 min or 24 h contact at 20° and 80°C was studied. The model solutions tested were water, 1% solutions of citric, lactic, or acetic acids, and 1% ethyl alcohol solution. Results (tabulated in part) confirmed that increasing contact time and temp. increased the rate of migration, no migration being observed in any instance after 10 or 60 min contact at 20°C. The conclusion is drawn that for practical evaluation of potential migration from the material studied, experimental conditions (specifically time/temp.) should correspond as nearly as possible to actual conditions. Literature on metal migration into various foods is briefly reviewed. HBr

## 42

**[Contamination of foods and feeds from selected areas of the Erfurt district with lead and cadmium. I. Determination of lead and cadmium in vegetable material by inverse voltammetry.]** Untersuchungen zur Kontamination von Lebens- und Futtermitteln ausgewählter Gebiete des Bezirkes Erfurt mit Blei und Cadmium. I. Bestimmung von Blei und Cadmium in pflanzlichem Material mittels Inversvoltammetrie.
Engst, R.; Lauterbach, K.; Beckmann, G.; König, R.
***Nahrung*** **23 (7)** 739–747 (1979) [31 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

A procedure is described for detn. of Pb and Cd in foods and feeds of vegetable origin, based on wet digestion of the sample with $HNO_3$ vapour followed by $HClO_3$, then detn. of Pb and Cd by inverse voltammetry using a Hg-coated stationary carbon electrode. Detection limit was 0.66 ng/ml for Pb, 0.3 ng/ml for Cd. When the method was applied to samples, recoveries were 102.0 ± 10.8% for Pb, and 101.6 ± 11.4% for Cd. With careful mixing of the material under test, this procedure permits the use of small samples. Advantages of the wet digestion procedure used include simplicity, rapidity and low likelihood of contamination of the sample. IN

## 43

**[Toxicological study of synthetic packaging materials used in the food industry.]**
Karger-Kucsis, J.
***Anyagmozgatas Csomagolas*** **26 (3)** 79–82 (1979) [16 ref. Hu]

Synthetic packaging materials used in the food industry should be examined for the presence of toxic substances which have a tendency to accumulate in the human body (e.g. heavy metals such as Cd and Pb and their compounds) and for carcinogenic properties. Since the human body may only tolerate a daily uptake of 400 µg Pb and 60 µg Cd the daily amounts of Pb and Cd originating from packaging materials should not be higher then 20 and 3 µg, resp. Although vinyl chloride, vinylidene chloride, acetonitrile and epichlorhydrin monomers have been shown to be carcinogenic in animal experiments, carcinogenicity can be significantly reduced by improved technology. The polystyrene contamination of foodstuffs from packaging materials is estimated to be 0.05-0.4 p.p.m., but its carcinogenic properties are not confirmed. There is no experimental data on the migration of polyolefins into food, but it is estimated to be in the parts/billion range. Because ethylene oligomers are almost indistinguishable from polyethylene waxes used for the treatment of paper-based packaging materials, the proposed total polymer and oligomer migration of 10 mg/dm$^2$ may limit the use of polyolefins as packaging materials. ESK

## 44

**[Heavy metal contents in deep-sea fishes.]**
Kobayashi, R.; Hirata, E.; Shiomi, K.; Yamanaka, H.; Kikuchi, T.
***Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi]*** 45 (4) 493-497 (1979) [16 ref. Ja, en] [Lab. of Food Hygienic Chem., Tokyo Univ. of Fisheries, Konan, Minato-ku, Tokyo 108, Japan]

In order to find whether deep-sea fish were safe to eat, heavy metal contents were determined in the muscles of 16 spp. caught off New Zealand and Patagonia. Heavy metal contents (p.p.m.) were as follows: 0.04-0.46 total Hg; 0.02-0.44 methylmercury; 0.08-0.46 Se; trace-0.03 Cd; 4.3-10.9 Zn; trace-0.53 Pb; and 0.12-9.99 As. The Hg contents of dory, *Cyttoidopus* sp. and tarakihi, *Cheilodactylus macropterus*, exceeded the temporary regulatory level of Hg in fish and shellfish. Contents of Se, Cd, Zn, and As in muscles of deep-sea fish were about the same as those of commercial fish, but Pb was present at somewhat higher levels in muscles of deep-sea fish. In dory muscle the amounts of total Hg and methylmercury were found to be proportional to body wt. There exists a significant correlation between the depth at which fish were caught and total Hg content, i.e. the deeper the fish live, the higher the total Hg found. AS

## 45

**[Heavy metal contents in marine organisms from the by-catch of the Belgian inshore fishery.]**
Clerck, R. de; Vanderstappen, R.; Vyncke, W.; Hoeyweghen, P. van
***Revue de l'Agriculture*** 32 (3) 793-801 (1979) [24 ref. Fr, en] [Sta. de Peche Maritime, Ankerstraat 1, B-8400 Oostende, Belgium]

The Hg, Zn, Cu, Pb, Cd and Cr contents were determined in 16 spp. of the Belgian inshore fishery by-catch. Tabulated results showed high Hg concn. in flounder *(Platichthys flesus*, mean 0.52 mg/kg) and horse mackerel *(Trachurus trachurus*, mean 0.73 mg/kg). With a few exceptions the concn. of the other metals were quite normal and mostly similar to those found on the high seas. Mean Cd concn. in anchovy was 0.07 mg/kg, all others ≤0.02 mg/kg. The continued use of flounder and horse mackerel as indicators of Hg pollution is recommended. RM

## 46

**Trace metal contamination of the rock scallop, *Hinnites giganteus*, near a large southern California municipal outfall.**
Young, D. R.; Jan, T.-K.
***Fishery Bulletin, National Oceanic and Atmospheric Administration*** 76 (4) 936-939 (1979) [12 ref. En]
[S. California Coastal Water Res. Project,
1500 E. Imperial Highway, El Segundo,
California 90245, USA]

Abnormal levels of Ag, Cd, Cr, Cu, Ni, Pb and Zn were found in 3 tissues of rock scallop (including the adductor muscle, prized as a delicacy), collected near the outfall of a municipal wastewater discharge from Los Angeles, California, USA. Levels found in 1974 and in 1976 were not significantly different, but were higher than those in control scallops collected near offshore islands. In adductor muscle, Cd (0.92 mg/kg), Cr (0.33 mg/kg), and Cu (0.32 mg/kg) levels, on a wet wt. basis, were significantly higher then controls ($P < 0.05$). JRR

## 47

**Heavy metals in the native oyster *(Ostrea angasi)* and mussel *(Mytilus edulis* planulatus) from Port Davey, South-western Tasmania.**
Thomson, J. D.
***Australian Journal of Marine and Freshwater Research*** 30 (3) 421-424 (1979) [13 ref. En] [Tasmanian Fisheries Development Authority, Crayfish Point, Taroona, Tasmania 7006, Australia]

Oysters and mussels were sampled from Port Davey in winter 1975 and summer and winter 1978. Mean metal concn. in oysters were (mg/kg wet wt.): Zn 954 (Jan. 1978) - 1662, Cd 0.15-0.25, Cu 4.7-20.6 (June 1975), and Pb 0.2-2.0 (June 1975); in mussels Zn 22.1-26.7, Cd 0.16-0.22, Cu 0.8-19.6 (June 1975) and Pb 0.3-4.1 (June 1975). The permissible concn. for Zn (1000 mg/kg) provisionally recommended by the National Health and Medical Research Council was exceeded in oysters, and the standard for Pb (2.0 mg/kg) in both mussels and oysters in the 1975 samples. As Port Davey is isolated and virtually uninhabited the metals derive from natural sources. Any recommended permissible concn. for Zn in shellfish should take cognizance of natural levels in isolated areas, and recognise that the Zn:Cd ratio in oysters is not fixed. RM

## 48

**Toxicologic studies with sheep fed colored magazines and newsprint.**
Heffron, C. L.; Reid, J. T.; Haschek, W. M.; Telford, J. N.; Stoewsand, G. S.; Bache, C. A.; Wszolek, P. C.; Lisk, D. J.
***Cornell Veterinarian*** 69 (4) 356-363 (1979) [17 ref. En] [Dep. of Anim. Sci., New York State Coll. of Agric. & Life Sci., Cornell Univ., Ithaca, New York 14853, USA]

Paper (Pb content 261 p.p.m.; polychlorinated biphenyl (PCB) content 187 parts/billion) containing coloured inks (e.g. newspapers, magazines) was pulverized, incorporated at a level of 23% (dry wt. basis) into a complete ration (Pb content 69 p.p.m., PCB content 88 parts/billion) and pelleted. A similar control ration (Pb content 0.5 p.p.m., PCB content 55 parts/billion) was prepared containing 23% oat hulls in place of the paper. The 2 rations were fed to groups of 4 Dorset wethers (age 3 months) for 175 days, salt and water being provided ad lib. Studies were made of animal performance (e.g. feed efficiency, wt. gain), deposition of PCB in kidney, deposition of Pb in tissues (blood, bone, brain, heart, kidney, liver, chuck and round muscle, pancreas, spleen) and faeces, changes in concn. of blood constituents, hepatic microsomal enzyme activity and histopathological changes. Pb from the paper was found to accumulate in tissues (particularly bone, kidney, liver and pancreas but not to a significant extent in muscle). PCB concn. were higher in the kidneys of control animals than in those of animals fed the paper ration. Histopathological examination of liver and kidney by light and electron microscopy revealed no lesions attributable to diet but hepatic microsomal mixed function oxidase activity was higher in paper-fed animals than in controls. Further study of the use of coloured newsprint in animal feeds is recommended. [See also *Journal of Agricultural and Food Chemistry* (1977) 25, 657-660.] JA

## 49

**[Lead, cadmium and arsenic contents in meat and organ samples of game from areas with varying heavy metal contamination.]** Blei-, Cadmium- und Arsengehalte in Fleisch und Organproben von Wild aus unterschiedlich schadbelasteten Regionen.

Holm, J.

***Fleischwirtschaft*** 59 (9) 1345-1349 (1979) [many ref. De, en] [Staatliches Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

Pb, Cd and As contents were determined in the liver and kidneys of hares, pheasants, ducks, roe deer and red deer and in the meat of hoofed animals (deer, wild sows and boars). Results are tabulated with regard to browsing conditions, i.e. animals from agricultural areas, browsing in fields, woodlands, near a town, or in an immission area. Only slight metal contamination was observed in the skeletal muscle of hoofed game (Pb 0.04-0.07, Cd 0.005-0.03, As 0.005-0.010 p.p.m., on fresh wt. basis), but fairly heavy Pb and Cd contamination in the organs (mean Pb 1.5-1.8 p.p.m. in hare liver, 1 p.p.m. in hare kidneys, 0.25-0.40 p.p.m. in liver and kidneys of hoofed game). Higher Pb contents were found in red deer from the Harz mountains (0.51-1.94 p.p.m. in liver, 0.75-2.45 p.p.m. in kidneys). The heaviest contaminations were observed in the organs of animals from an immission area (e.g. max. Pb contents in hare liver 21.22 p.p.m., in duck liver 7.25, in roe deer liver 3.69; corresponding levels in kidneys 10.07, 33.04 and 10.31 p.p.m.). Cd contents in the kidneys were affected mainly by the age of the animals and varied between 0.5 and 12.0 p.p.m., in livers between 0.05 and 1.3 p.p.m. except for the immission area (max. 16.39 in livers, 121.05 in kidneys). As contents were 0.005 to 0.010 p.p.m., and presented no problems. It is suggested that game kidneys be discarded, and care exerted in marketing game from immission areas. [From En summ.] RM

## 50

**[Pb, Cu, Zn, Mn and Fe content in products canned in tinplate.]**

Branca, P.; Maina, E.

***Bollettino dei Chimici dei Laboratori Provinciali*** **5** (4) 593-600 (1979) [6 ref. It, de, en, fr] [Lab. Chimico Provinciale, Via S. Domenico 22 b, 10122 Torino, Italy]

150 samples of food in tinplate cans were analysed. The following mean values were determined for all foods (p.p.m.): Pb 1.04; Cu 1.05; Zn 4.67; Fe 6.84; Mn 0.67. The range and mean concn. of these metals were: for peeled tomatoes, 0-10.00 (mean 0.80), 0-4.75 (1.52), 2.00-21.00 (4.11), 1.70-16.25 (8.17), 0-1.30 (0.63), resp.; for juices, 0-10.0 (1.41), 0-5.50 (1.10), 0.50-15.00 (5.61), 0.75-42.50 (7.32), 0-2.00 (0.64); for vegetables, 0-8.00 (1.03), 0-4.00 (0.78), 1.20-11.0 (5.12), 0.75-12.70 (6.35), 0-4.00 (0.80); for fruits, 0-11.00 (0.86), 0-3.00 (0.85), 1.10-10.00 (3.51), 1.00-67.00 (5.37), 0-1.50 (0.56); for marine products, 0.37-25.00 (3.83), 0.75-10.00 (2.62), 2.50-47.60 (22.30), 4.25-55.00 (17.50), 0-4.70 (1.58) and Ni 0-2.00 (0.44) (not detected in any other type of product). RM

## 51

**[Toxic trace elements in foods.]** Toxische Spurenelemente in Lebensmitteln.

Treptow, H.; Bielig, H. J.

***Verbraucherdienst, B*** 23 (7) 163-166 (1978) [De] [Inst. für Lebensmitteltech., Tech. Univ., Berlin]

A total of 164 samples of 22 types of vegetables (not including root vegetables) and 88 samples of 10 types of fruit were analysed for As, Cd, Pb and Hg by flameless AAS. As concn. in vegetables ranged from 0.016 mg/kg for green beans to 0.50 mg/kg for spinach; values for fruit ranged from 0.033 mg/kg (various types) to 0.19 mg/kg for apples. Pb concn. in vegetables were <0.3 mg/kg, except for parsley (≤1.02 mg/kg) and spinach (≤0.93 mg/kg). Pb concn. in fruit were <0.3 mg/kg except for 2 apple samples which contained ≤0.433 mg/kg. The highest Cd concn. in vegetables were recorded for chives (0.082 mg/kg), spinach (0.069 mg/kg) and parsley (0.058 mg/kg); all fruit contained ≤0.03 mg Cd/kg, except for 1 apple sample with 0.116 mg/kg. All Hg concn. were below the recommended limit of 50 parts/billion. Heavy metal levels in fungi are briefly considered (no experimental data given). The role and activities of the Central Institution for Recording and Evaluation of Environmental Chemicals in the Federal Republic of Germany are briefly discussed. AJDW

## 52

**Mercury, chromium, lead and organochlorine residues in some food products of animal origin: a review.** [Review]

Maggi, E.; Bracchi, P. G.; Campanini, G.; Dazzi, G.; Madarena, G.

***Meat Science*** 3 (4) 309-319 (1979) [34 ref. En] [Istituto di Ispezione degli Alimenti, Univ. di Parma, Parma, Italy]

This review includes tables of data for levels of Hg, Pb, Cr, BHC, heptachlor, heptachlor epoxide, aldrin, dieldrin, DDE, DDD, DDT and methoxychlor in a wide range of foods of animal origin marketed in the North of Italy, including fresh, frozen and canned meat and meat products, offals, poultry, eggs, dairy products, fresh, frozen and canned fish, and shellfish. Levels of these contaminants were generally appreciably below WHO suggested max. tolerances. AJDW

## 53

**Lead absorption in man from dietary sources. The effect of cooking upon lead concentrations of certain foods and beverages.**
Moore, M. R.; Hughes, M. A.; Goldberg, D. J.
***International Archives of Occupational and Envronmental Health*** 44 (2) 81-90 (1979) [14 ref. En] [Dep. of Med., Univ. of Glasgow, Western Infirmary, Glasgow G11 6NT, UK]

Intake of Pb from piped water used for cooking vegetables and preparation of beverages was studied using $^{203}$Pb; it was shown that plant foods absorb Pb from hot water. Carrots, peas, cabbage and macaroni were cooked in Pb solutions of 0.1-5.0μM concn.; Pb was concentrated in the foods from solution. Addition of NaCl (0-300mM) decreased uptake of Pb. Tea leaves and coffee grounds also absorbed Pb from solution so that for initial Pb concn. in water of 1.0μM, final concn. in tea and coffee were 0.39μM and not detectable, resp. There was no consistent difference in Pb concn. of water from running taps and after heating in domestic electric kettles. Uptake of Pb from tap water into cooked vegetables may be an additional source of dietary Pb. DIH

## 54

**Trace metal content of rapeseed meals, oils and seeds.**
Elson, C. M.; Hynes, D. L.; MacNeil, P. A.
***Journal of the American Oil Chemists' Society*** 56 (12) 998-999 (1979) [6 ref. En] [Dep. of Chem., Saint Mary's Univ., Halifax, Nova Scotia, Canada B3H 3C3]

The concn. of Pb, Cu, Cd and Zn as determined by anodic stripping voltammetry and AAS in a series of rapeseed oils, meals, and seeds is reported. The metal content of rapeseed seeds is not influenced by growing area; however, the var. appears to affect the metal levels. In general, meals contain twice the heavy metal burden of the seeds. The partitioning of metals between meals and oils heavily favours the meals except for Pb where the distribution is approx. 2 to 1. AS

## 55

**Systematic investigations of the heavy metal pollution (Cd, Pb, Cu, Zn, Cr, Ba) of drinking water using atomic absorption spectrometric methods.**
Bozsai, G.; Csanady, M.
***Zeitschrift für Analytische Chemie*** 297 (5) 370-373 (1979) [21 ref. En, de] [Nat. Inst. of Public Health, POB 64, H-1966 Budapest, Hungary]

140 samples of drinking water were collected at a water treatment plant and from domestic water supply. Samples were analysed for heavy metal pollution by electrothermal AAS directly, and after preconcn. by chelate extraction with ammonium tetramethylene dithiocarbamate methyl isobutyl ketone. Tabulated results showed fairly good agreement between the 2 methods. Filterable residues from tap water and sediments of reservoirs in the distribution system were analysed by flame AAS after acid digestion. Results are discussed in relation to Hungarian Drinking Water Standards. No significant heavy metal pollution originating from surface water and no significant dissolution from pipe materials was observed. Heavy metals were adsorbed on the surface of residue materials and were concentrated in the sediments of the reservoirs. RM

## 56

**[Studies on residues of added metals in grape must after fermentation.]** Untersuchungen zum Verbleib von Schwermetallen, die Traubenmost zugesetzt wurden, nach Ablauf der Gärung.
Mohr, H. D.
***Weinberg und Keller*** 26 (7) 277-288 (1979) [11 ref. De, en] [Biol. Bundesanstalt für Land- & Forstwirtschaft, Inst. für Pflanzenschutz im Weinbau, Bernkastel-Kues/Mosel, Federal Republic of Germany]

In fermentation tests with artificially contaminated Riesling musts of 1976 and 1978, the effects of heavy metals on fermentation, and their elimination were investigated. The following results were obtained: inhibition of fermentation only occurred at fairly high concn., the toxicity increasing in the following order: Zn, Co, $Cr^{6+}$, Tl, V (≤500 p.p.m.) < Pb (200-400 p.p.m.) < Ni, $Cr^{3+}$ (250 p.p.m.) < Se (50-100 p.p.m.) < Cu (25-50 p.p.m.) < As (10-25 p.p.m.) < Hg (5-10 p.p.m.) < Cd (2-5 p.p.m.); the rate of elimination after fermentation increased as follows: Zn, Co, Ni, $Cr^{3+}$ (about 0%) < As (12-33%) < Cd (34-79%) < Pb (51-90%) < Cu, Hg, Se (86-100%). The formation of insoluble metal sulphides was a decisive factor for the elimination of metals from musts. AS

## 57

**[Effect of sewage sludge compost on heavy metal contents of vineyard soils, grapevines and must.]** Einfluss von Müll-Klärschlammkompost auf den Schwermetallgehalt von Weinbergsboden, Reborganen und Most.
Mohr, H. D.
***Weinberg und Keller*** 26 (8) 333-344 (1979) [22 ref. De, en] [Biol. Bundesanstalt für Land- & Forstwirtschaft, Inst. für Pflanzenschutz im Weinbau, Bernkastel-Kues/Mosel, Federal Republic of Germany]

The enrichment of vineyard soils in heavy metals (Zn, Cu, Pb, Cd, Co, Ni, Cr) by sewage compost and sewage sludge compost, and their uptake by grapevines and appearance in musts was studied in field and pot experiments. Tabulated results showed no significant increases in metal content of grapes and musts after application of up to 300 t/ha. RM

## 58

**[Determination of lead in wine, must and grape juice from Rioja (Spain).]**
Perez Saenz, J. L.; Farre Rovina, R.; Pijol Forn, M.

*Revista de Agroquimica y Tecnologia de Alimentos* 19 (3) 417–422 (1979) [5 ref. Es, en] [Univ. de Barcelona, Barcelona, Spain]

Pb contents were determined by the previously described method (involving complex formation with pyrrolidine dithiocarbamate, extraction with methyl isobutyl ketone and AAS) of Anderes et al. [FSTA (1976) 8 9H1514] in 60 samples of red, white and rose wines, from 1972 to 1977, bottled or stored in bulk, 4 grape juices and 17 musts from the Rioja region. Tabulated results revealed only 1 wine with Pb concn. (0.31 p.p.m.) in excess of the FAO/WHO max. tolerance level of 0.30 p.p.m. The other 80 samples contained 0.01–0.12 p.p.m. Pb (only 4 samples with > 0.10 p.p.m.) irrespective of colour, age and storage. RM

## 59

**[Metal contaminants in the water and shell fish from Rias Bajas de Galicia. III. Determination of lead, copper, zinc and bismuth.]**

Outon, A.; Creus, J. M.; Charro, A.; Simal, J.

*Anales de Bromatologia* 31 (1) 81–90 (1979) [16 ref. Es, en] [CSIC, Santiago de Compostela, Spain]

Pb, Cu, Zn and Bi in sea water were determined by simultaneous extraction of their complexes with ammonium pyrrolidine dithiocarbonate (APDC) into methyl isobutyl ketone (MIBK) followed by AAS. Shellfish samples were dry ashed at 500°C and dissolved in 1N HCl. Recoveries of the 4 metals were 92, 92, 98 and 89% by extraction, 88, 89, 95 and 88% by dry ashing. Tabulated results showed similar levels of contamination in all 4 estuaries, with mean 2.98, 2.00, 20.43 and 3.30 parts/billion (ppb) in the water; contamination of shellfish varied with the species and metal. Mean Pb contamination in mussels, cockles, oysters and clams was 0.95, 0.86, 0,81 and 0.98 ppb, Cu contamination 1.20, 1.20, 7.27 and 1.25 ppb, Zn contamination 2.29, –, 23.67 and 2.06 ppb and Bi contamination 1.06, 0.51, 0.92 and 0.92 ppb resp. [See preceding abstr. for part II.] RM

## 60

**[The carry-over of toxic elements into the meat of farm animals.]** Zum Carry over von toxischen Elementen in das Fleisch von Nutztieren.

Hecht, H.

*Fleischwirtschaft* 59 (11) 1621, 1624, 1626, 1628–1629; 1693 (1979) [17 ref. De, en] [Bundesanstalt für Fleischforschung, 8650 Kulmbach, Federal Republic of Germany]

This lecture discusses the carry-over or transfer of toxic substances from the feed to foods of animal origin, the aims and methods used to study carry-over of toxic metals (mainly Pb and Cd), and some results of Pb and Cd detn. in the meat, liver and kidneys of beef, pork, lamb, turkey, deer and wild rabbit from metal-polluted and unpolluted areas of Germany. Tabulated results show max. Pb levels of 57 parts/billion (p.p.b.) fresh wt. basis in the meat of domestic animals, 607 p.p.b. in rabbit meat with much higher levels in liver (max. 1510 p.p.b. in lamb and 24 000 p.p.b. in rabbit from polluted area) and in kidneys (804 p.p.b. in lamb, 8353 p.p.b. in rabbit from polluted area); corresponding levels for Cd are max. 14.4 p.p.b. in pork, 17.6 in deer and 17.8 in rabbit meat, 307 p.p.b. in beef and 2950 in rabbit liver, 540 p.p.b. in pork and 23 100 in rabbit kidneys. Results show that toxic metal contents in most meats are considerably below the proposed max. tolerances of 300 p.p.b. for Pb, 100 p.p.b. for Cd, but excessive concn. occur in some offals as a result of carry-over from contaminated feed. RM

## 61

**[Studies on residues in Austria. I. Lead, cadmium and chromium in beef from Upper Austria.]**

Rückstandsuntersuchungen in Österreich. I. Untersuchungen über Blei-, Cadmium- und Chromgehalt in Rindfleisch aus Oberösterreich.

Ruttner, O.; Jarc, H.

*Wiener Tierärztliche Monatsschrift* 66 (8/9) 259–262 (1979) [16 ref. De, en] [Bundesanstalt für Virusseuchenbekämpfung bei Haustieren, Emil-Behringweg 3, A-1231 Vienna, Austria]

Samples from 180 cattle from Upper Austria were subjected to wet digestion with $HNO_3$, and examined for metal residues by flameless AAS. Tabulated results were as follows (p.p.m. on fresh wt., range and mean): Pb 0.09–1.03 and 0.31; Cd 0.01–0.20 and 0.05; Cr 0.05–0.25 and 0.11. Up to 63% of Pb contents, 26% of Cd contents and 4% of Cr contents were above suggested max. values. RM

## 62

**[Studies on residues in Austria. II. Heavy metals, pesticides and antibiotics residues in Carinthian cattle.]** Rückstandsuntersuchungen in Österreich. II. Untersuchungen über Schwermetall-, Pestizid- und Antibiotikarückstände in Rindern aus Kärnten.

Jarc, H.; Tratnig-Frankl, E.

*Wiener Tierärztliche Monatsschrift* 66 (10) 297–300 (1979) [21 ref. De, en] [Bundesanstalt für Virusseuchenbekämpfung bei Haustieren, Emil-Behringweg 3, A-1231 Vienna, Austria]

Meat, fat, liver, kidney and spleen from 23 animals were examined for Pb, Cd and Hg, pesticide and antibiotics residues by flameless AAS, GLC and the *Bacillus subtilis* test, resp. Tabulated results showed no antibiotics residues; no aldrin, heptachlor, endrin and PCNB; DDT and dieldrin in 1 fat and 1 liver sample each; and HCB, HCH and DDE at concn. far below legal tolerances (max. HCB 16.0, α-HCH 10.2, α-HCH 106.0, DDE 34.4, DDT 166.0, dieldrin 1.3 parts/billion, all in fat). Up to 83% of the Pb, 9% of Cd and no Hg concn. exceeded legal tolerances: 4% of liver samples had > 2 p.p.m. Pb, 52% > 0.5 p.p.m. Pb (max. 2.18); 13% of meat samples had > 0.5 p.p.m. and 74% > 0.2 p.p.m. Pb (max. 0.75); 4% of liver samples had > 0.5 p.p.m. Cd (max. 0.85); and 13% of meat samples contained > 0.1 p.p.m. Cd (max. 0.26). No sample had > 0.5 p.p.m. Hg. RM

## 63

**Drinking water – determination of lead, selenium and arsenic contents.**

Oman, Ministry of Commerce & Industry

*Omanian Standard* OS 15, 29pp. (1979) [En, Ar]

This standard specifies methods for the detn. of contents of Pb (by colorimetry), Se (by photometry) and As (using Gutzeit generator) in drinking water. A list of Omanian standards relating to drinking water is appended. KME

## 64

**[Recent publications on toxicity of metallic contaminants taken up by canned foods from the can material.]** [Review]
Boudene, C.
***Medecine et Nutrition*** 15 (6) 425–430 (1979) [58 ref. Fr] [UER des Sci. Pharmaceutiques & Biol., Univ. de Paris-Sud, Paris, France]

This review covers uptake of Pb, Sn, and Al by foods from cans, the toxicity of these metallic contaminants, max. tolerances for these metals in foods, and the significance of the health hazard from metals in canned foods. AJDW

## 65

**[Trace elements in nutrition of babies: arsenic, lead, cadmium.]** Spurenelemente in der Kleinkindernahrung: Arsen, Blei, Cadmium.
Woidich, H.; Pfannhauser, W.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 170 (2) 95–98 (1980) [18 ref. De, en] [Forschungsinst. der Ernährungswirtschaft, Blaasstrasse 29, A-1190, Vienna, Austria]

Dietary intake of As, Pb and Cd by babies in the 1st 12 months was studied. Tabulated data give contents of the 3 elements in milks, infant formulae and infant foods. Contents of As in dried milks, cereal formulae and foods in jars were (μg/kg): 10.0–13.4, 30.8 and 13.7–16.5, resp. Corresponding figures for Pb were (mg/kg) 0.12–0.15, 0.14–0.15, and 0.10–0.11 and for Cd were (mg/kg) 0.02–0.031, 0.032–0.041 and 0.0021–0.032. The relative excess of As in cereal foods was noted. Total intake of the trace elements was calculated for adults and babies on a μg/kg body wt. basis; intake of Pb by babies was higher than that by adults. Regular control of infant foods for harmful trace elements is recommended. DIH

## 66

**Changes in lead concentration of foods stored in their opened cans.**
Capar, S. G.
***Journal of Food Safety*** 1 (4) 241–245 (1978, publ. 1979) [7 ref. En] [FDA, 200 C Street SW, Washington, DC 20204, USA]

1 can of each of several common fruits and fruit juices were analysed for Pb concn. after 0, 2 and 5 days storage at 6°C in open cans. Controls of similar products packaged in glass were used wherever possible. Results of the analyses are tabulated. A comparison of day 0 results indicated that canned products already contain at least 60% more Pb than glass packaged products. Pb concn. of most canned products increased between successive sampling days, but the amount of increase varied among samples. Canned fruit cocktail increased about 1.5 × (0.16 to 0.24 p.p.m. Pb) between day 0 and day 5 and canned orange juice increased about 7 × (0.05 to 0.36 p.p.m. Pb). None of the glass-packed products showed a Pb increase. SP

## 67

**[The carry-over of Pb, Cd and Hg in chickens.]** Zum carry-over Verhalten von Blei, Cadmium und Quecksilber bei Hühnern. [Review]
Nezel, K.
***Mühle + Mischfuttertechnik*** 117 (3) 30–32 (1980) [16 ref. De]

The distribution of Pb, Cd and Hg was determined in the tissues of broilers and hens after prolonged feeding with contaminated feeds, and also in eggs laid by the hens. The data are used to show the carry-over of these toxic metals into edible tissues and eggs. RM

## 68

**[Contents of Hg, Pb and Cd in salt- and fresh-water fishes.]**
Bulinski, R.; Kot, A.; Kotulas, K.; Szydlowska, E.
***Bromatologia i Chemia Toksykologiczna*** 12 (2) 169–173 (1979) [18 ref. Pl, en, ru] [Zaklad Bromatologii Inst. Tech. i Analizy Farmaceutycznej Akad. Med., Lublin, Poland]

Mean Hg contents of 5–10 samples of 11 commercial frozen salt-water fish (determined by AAS) ranged from 0.008 to 0.023 mg/kg; Pb (colorimetry) contents ranged from 0.034 to 0.175 mg/kg; and Cd (colorimetry) from 0.032 to 0.059 mg/kg. Corresponding levels in 2–5 samples of 14 fresh-water fish were Hg 0.004–0.210, Pb 0.010–0.316 and Cd 0.018–0.094 mg/kg. HBr

## 69

**[Lead and cadmium levels in livers of monogastric and polygastric animals, determined by AAS.]**
Palacios Remondo, J.; Rairrez Diaz, S.
***Revista de Agroquimica y Tecnologia de Alimentos*** 19 (2) 279–282 (1979) [9 ref. Es, en] [Colegio Univ., Logrono, Spain]

Pb and Cd levels were determined by AAS in 30 samples each of beef, sheeps', goats' (polygastric) and pigs' (monogastric) liver obtained from the municipal abattoir. Tabulated results for the 4 spp. were, resp. (p.p.m.): Pb 0–8.30 (mean 2.55), 0–5.71 (1.31), 0–5.83 (0.83) and 0–4.80 (1.23); and Cd 0–0.30 (0.06), 0–0.52 (0.13), 0–1.11 (0.22), and 0–0.99 (0.14). RM

## 70

**High temperature dry ashing of foods for atomic absorption spectrometric determination of lead, cadmium, and copper.**
Feinberg, M.; Ducauze, C.
***Analytical Chemistry*** 52 (1) 207–209 (1980) [8 ref. En] [Lab. Central d'Hygiene Alimentaire, Min. de l'Agric., Services Vet., 43 Rue de Dantzig, 750 15 Paris, France]

High temp. dry ashing, i.e. (i) direct calcination at 750°C, was used for detn. of Pb, Cd and Cu in a large number of different foods, and compared with (ii) a method involving, as an initial step, classic dry ashing at 450°C, followed by attack with 3 ml $HNO_3$ and a second calcination at 750°C. 2 ml $H_2SO_4$ was used as ashing aid in both methods. Recoveries of added metals in some vegetables, dairy products, meats and fish are shown in a table. The 2 methods gave significantly different results; best recovery levels and relative s.d. were obtained with the quicker method (i), but the losses were about 10% and relative s.d. 10–12%. However, taking into consideration only 11 foods with a basic composition similar to bovine liver, the recoveries and relative s.d. were, resp., 95.6% and 6.2% for Pb, 95.3% and 4.7% for Cd, and 94.5% and 12.3% for Cu. Method (i) is thus particularly well suited for the detn. of heavy metals in protein-rich biological materials such as meat and fish. AL

## 71

**[Sample digestion procedures for determination of Pb, Fe and Zn in canned soups by AAS.]** Aufschlussmethode zur Blei-, Eisen- und Zinnbestimmung in Dosensuppen mittels AAS.
Knezevic, G.; Hüppe, K.
***Deutsche Lebensmittel-Rundschau*** 76 (2) 50–52 (1980) [4 ref. De, en, fr] [Fraunhofer Inst. für Lebensmitteltech.- & Verpackung, 8000 Munich 50, Federal Republic of Germany]

2 methods for preparation of samples for AAS analysis were compared: (i) digestion with 65% $HNO_3$ for 30 min at 100°C; or (ii) pressure digestion with 65% $HNO_3$ at 160°C overnight. Trials were conducted on 1-yr-old retail samples of canned tomato, beef or goulash soups. Data are given for Pb, Fe and Zn concn. in samples prepared by the 2 methods. Mean values with ranges for metal concn. in goulash, beef and tomato soup, resp., were (mg/kg): Pb, 0.13 and 0.12-0.14, 0.07 and 0.06-0.08, and 0.12 and 0.11-0.14; Fe (ranges only), 17.4-17.8, 6.0-6.5 and 12.7-12.8; and Zn, 3.1 and 3.0-3.2, 5.8 (for all samples), and 0.40 and 0.35-0.42. Values for samples digested by methods (i) and (ii) generally agreed well. AJDW

## 72

**[Analytical characteristics of the pressure digestion method for organic materials.]** Analytische Eigenschaften des Druckaufschlusses organischer Substanzen.
Plesch, R.
***Zeitschrift für Analytische Chemie*** 298 (5) 400–403 (1979) [3 ref. De, en] [Siemens AG, Bereich Mess- & Prozesstechnik, Postfach 211080, D-7500 Karlsruhe 21, Federal Republic of Germany]

In connection with the recently introduced pressure digestion method for organic materials [FSTA (1979) 11 11S1713], data for the recovery rates of 50–500 parts/billion Hg, As, Pb and Cd in beef and pork meat, liver and kidneys from 142 digestions were examined by photometry, AAS and X-ray fluorescence analysis (XFA). Statistical evaluation showed that the recovery rate at <1 p.p.m. was independent of the concn. and of the matrix. The global mean recovery for each element was >90%, allowing very wide application of the method (i.e. 90.2% for Hg, 90.7 for As, 94.8 for Pb, 93.8 for Cd). The mean s.d. for single results was 5.2% for AAS, 6.2 for XFA and 8.9 for photometry. RM

## 73

**[Use of electronic data processing in evaluation of residue determinations as exemplified by heavy metals.]** Einsatz der elektronischen Datenverarbeitung bei der Auswertung von Rückstandsuntersuchungen am Beispiel der Schwermetalle. [Lecture]
Schmidt, E. H. F.
***Proceedings of the European Meeting of Meat Research Workers*** No. 24, L9:1–L9:7 (1978) [De, en, fr, ru] [Zentrale Erfassungs- & Bewertungsstelle für Umweltchemikalien, Bundesgesundheitsamt, Postfach, D-1000 Berlin 33]

The procedures for collection and evaluation of data on environmental chemicals and the software and hardware used for the purpose in the author's Establishment are described. The reports are available to the Federal and Länder Governments and, within data protection limitations, also to others interested. [See FSTA (1980) 12 8S1280.] SKK

## 74

**Lead in albacore: guide to lead pollution in Americans.**
Settle, D. M.; Patterson, C. C.
***Science, USA*** 207 (4436) 1167–1176 (1980) [many ref. En] [Div. of Geological & Planetary Sci., California Inst. of Tech., Pasadena, California 91125, USA]

Ease of introducing serious errors into Pb analysis of foods, and hence of underrating effects of Pb pollution are illustrated by analysis of commercial canned, and freshly prepared, albacore (white tuna). Pb concn. measured in ultraclean conditions by isotope dilution were as follows (ng/g wet wt.): (i) fresh albacore muscle, dissected under clean conditions, 0.3; (ii) canned muscle from unsoldered die-punched can, 7; (iii) National Bureau of Standards (NBS) reference albacore muscle, 120 (fresh wt. equivalent; actual concn. in dried sample was 400 ng/g DM); (iv) canned muscle from lead-soldered can, 1400. Data are also presented for Ba and Ca contents; these show that bone content of samples would introduce insignificant levels of Pb contamination. As a comparison, samples were analysed by the National Marine Fisheries Service (NMFS) laboratory in Maryland by standard methods. Fresh albacore muscle dissected by NMFS was reported to contain 400 ng Pb/g wet wt.; values for samples (i) and (iv) were 20 and 700 ng/g, resp. Results show that the NBS reference material is not representative of fresh muscle because of Pb contamination during grinding and drying, and that less than rigorously ultraclean dissection and analysis techniques seriously overestimate Pb content of uncontaminated samples, hence leading to false conclusions about effects of Pb pollution from industrial sources. Toxicological significance of Pb in food is reviewed, and Pb content of diet in prehistoric times is estimated and compared with that in the present-day American diet. It is recommended that lead-soldered cans be eliminated immediately; that Pb analyses should be performed under ultraclean conditions using appropriate reference materials; and that the significance of high present-day Pb intakes should be evaluated by studies of effects of Pb on biochemical processes in ultraclean conditions. DIH

## 75

**Developments in land methods of wastewater treatment and utilisation.** [Conference proceedings]
Jenkins, S. H. (International Association on Water Pollution Research) (Editor)
***Progress in Water Technology*** 11 (4/5) 1-532 (1979) [many ref. En]

This issue of the journal contains the proceedings of a conference on developments in land methods of wastewater treatment and utilization, held in Melbourne, Victoria, Australia on 23-27 Oct. 1978. Papers include: Environmental sources of heavy metals and their toxicity to man and animals, by E. J. Underwood (pp. 33-45, 45 ref.). Heavy plant [heavy metals] accumulation in soils irrigated by sewage and effect in the plant-animal system, by K. J. Evans, I. G. Mitchell & B. Salau (pp. 339-352, 14 ref.). Investigations on the use of sludge as a fertilizer in a market garden area north of Adelaide, South Australia, by M. P. C. de Vries (pp. 445-450, 10 ref.). Elimination mechanisms by soil filtration and application as a hillside seepage system in the area of a reservoir for potable water, by A. Grau (pp. 459-472). One paper is abstracted separately in FSTA and can be found in the author index under International Association on Water Pollution [Wastewater Symposium]. AL

## 76

**Residues of lead and arsenic in crops cultured on old orchard soils.**
Kenyon, D. J.; Elfving, D. C.; Pakkala, I. S.; Bache, C. A.; Lisk, D. J.
***Bulletin of Environmental Contamination and Toxicology*** 22 (1/2) 221-223 (1979) [16 ref. En] [Dep. of Pomology, Pesticide Residue Lab., New York State Coll. of Agric. & Life Sci., Cornell Univ., Ithaca, New York 14853, USA]

High concn. of Pb and As are found in the upper few cm of apple orchard soils where insecticide compounds such as lead arsenate and calcium arsenate have been used for many yr. 5 crops (sweet corn, cucumber, musk melon, summer squash and tomato) were planted on loam soil which was formerly orchard land near Interlaken, New York, and which had received applications of Pb and As compounds for many yr. The same plants were grown on non orchard soil to serve as controls. At maturity, the edible portion of each crop was harvested, and Pb determined by conventional anodic stripping voltammetry and As by silver diethyldithiocarbamate spectrophotometric procedure. As and Pb were also determined in the soil. No significant differences ($p > 0.05$) between the treatments were observed in the concn. of As and Pb using Wilcoxons signed rank test. No phytotoxic effects were seen in any of the crops that could be attributed to As residues in the orchard soil. VJG

## 77

**Factors affecting heavy metal content of garden vegetables.**
Preer, J. R.; Stephens, B. R.; Sekhon, H. S.
***Abstracts of Papers, American Chemical Society*** 178 (1) ENVR 139 (1979) [En] [Interdisciplinary Sci. Program, Univ. of District of Columbia, Washington, DC 20001, USA]

Analyses of soil and vegetables from gardens in metropolitan Boston and Washington, DC, indicate the existence of elevated Pb and Cd content in some gardens. The analytical method involves dry ashing of dry, powdered vegetable samples, and shows both improved sensitivity over wet ashing and good agreement with certified values for Pb and Cd in NBS Standard Reference Materials. The heavy metal content of the vegetables analysed shows a strong dependence on the edible part, with garden fruits lower in heavy metals than leafy or root vegetables. Sp. differences in Pb and Cd uptake among leafy vegetables have been observed. Elevated Pb content was found in leafy vegetables grown near heavy traffic, and in leafy and root vegetables from gardens with high soil Pb content. Elevated Cd content was found in gardens with elevated soil Cd and those with low soil pH. AS

## 78

**Performance and tissue mineral composition of ruminants fed cage layer manure in combination with monensin.**
Pravee Vijchulata; Henry, P. R.; Ammerman, C. B.; Becker, H. N.; Palmer, A. Z.
***Journal of Animal Science*** 50 (1) 48-56 (1980) [25 ref. En] [Dep. of Anim. Sci., Univ. of Florida, Gainesville, Florida 32611, USA]

24 steers, average initial wt. 256 kg, were used in a 2 × 3 factorial arrangement of treatments to determine the effect of monensin (22 g/t) in combination with 3 levels of cage layer manure (CLM) from poultry as a replacement for soybean meal in finishing diets. Average daily gains, feed intake and feed conversion, and ruminal propionic acid concn. were determined for 0, 12.5 and 25.0% CLM with and without monensin. Carcass evaluation showed no significant differences due to these feeding treatments in quality or yield grades, dressing %, or flavour or juiciness of broiled steaks. Addition of CLM increased Ca ($P < 0.01$) in muscle, Cu ($P < 0.01$) in liver, Mg ($P < 0.01$) and P ($P < 0.05$) in kidney, As ($P < 0.05$) in kidney and muscle, and decreased Fe ($P < 0.05$) in kidney. Levels of As, Pb, Cd and Hg did not accumulate to levels harmful to ruminants. AL

## 79

**Effects of dried digested sludge and corn grown on soil treated with liquid digested sludge on performance, carcass quality and tissue residues in beef steers.**
Bertrand, J. E.; Lutrick, M. C.; Breland, H. L.; West, R. L.
***Journal of Animal Science*** 50 (1) 35-40 (1980) [13 ref. En] [Agric. Res. Cent., Univ. of Florida, Jay, Florida 32565, USA]

24 steers were randomly allotted and fed 1 of 3 diets for 141 days to determine the effects of digested municipal sludges on performance, carcass quality and concn. of selected potentially toxic metals in liver, muscle and kidney tissues. The experimental diets consisted of (i) control corn diet, (ii) CDS corn diet, i.e. 500 g/head/day of dried Chicago digested sludge (CDS)

incorporated into the control corn diet, and (iii) LDS corn diet, i.e. corn produced from soil treated with surface applications totalling 7.6 cm/ha of Pensacola liquid digested sludge (LDS) prior to planting. Diets (ii) and (iii) had no effect on performance and carcass quality measurements of beef steers. No significant differences in concn. of selected metals were detected in livers and kidneys of steers fed (i) and (iii). With steers fed (ii), the Cd, Cu, Fe and Pb concn. in livers were higher ($P < 0.01$ for Cd, Cu and Fe; $P < 0.05$ for Pb); metal concn. in muscles were all within accepted tolerance or guideline limits; accumulations of Cd, Fe, Hg and Pb in kidneys were higher ($P < 0.01$) than those of the other 2 diets; and higher ($P < 0.01$) Cd concn. were observed in livers and kidneys. Since Cd exposure can cause kidney damage, the Cd content of a sewage sludge could determine the amount that could be safely applied to agricultural land. AS

## 80

**Cement kiln dust in an all-concentrate diet for feedlot steers.**
Mathison, G. W.; Thompson, J. R.
*Canadian Journal of Animal Science* 59 (4) 699-705 (1979) [14 ref. En, fr] [Dep. of Anim. Sci., Univ. of Alberta, Edmonton, Alberta, Canada T6G 2E3]

2 groups of 16 steers were fed on all-concentrate diet (i) with or (ii) without 3.5% cement kiln dust for 125 days, both groups of cattle ate an average of 9.2 kg. feed/day. Effect of cement kiln dust on carcass characteristics and Pb level of body tissues were analysed. Results, tabulated show that (i) and (ii) had no significant effect on warm carcass wt., dressing %, rib-eye area, fat depth, carcass grade or number of abscessed livers. Pb levels in kidney tissues were significantly higher ($P > 0.01$) in animals fed (ii) than (i), and diets had no effect on Pb levels in muscle tissue, blood or liver. SP

## 81

**[Polarographic method for determination of lead and cadmium in meat and meat products.]** [Lecture]
Shumkova, I. A.; Karpova, I. N.
***Proceedings of the European Meeting of Meat Research Workers*** No. 24, L6:1-L6:6 (1978) [12 ref. Ru de, en, fr] [Vses. Nauchno-issled. Inst. Myasnoi Promyshlennosti, Moscow, USSR]

It was found that Pb and Cd could be determined simultaneously in meat and meat products by the method of Manuilova & Spektor [FSTA (1978) 10 5J557] provided ashing was carried out by the procedure of Friend et al. [*Atomic Absorption Newsletter* (1977) 16 (2) 46] modified by reduction of concn. of magnesium nitrate solution from 10 to 2.5%. Using the PPT-1 polarograph (USSR), with a sensitivity of 0.01 mg/kg, recoveries of $\geq 94\%$ Pb and 79-102% Cd, and reproducibility of 2.4-18.0% (variation coeff.) were obtained depending on concn. of Pb and Cd in samples. [See FSTA (1980) 12 8S1280.] SKK

## 82

**Determination of lead in drinking water by atomic-absorption spectrophotometry using an electrically heated graphite furnace and an ammonium tetramethylenedithiocarbamate extraction technique.**
Mitcham, R. P.
***Analyst*** 105 (1246) 43-47 (1980) [8 ref. En] [Essex Water Co., Langford, Maldon, Essex CM9 6QA, UK]

The detn. of Pb in drinking water using electrothermal atomisers has been shown to suffer from serious suppression effects. This paper deals with a semi-micro technique that chelates and separates the Pb into an organic extract prior to analysis. The extract is then injected directly into the atomiser without the need to separate the 2 phases. The method is shown to conform to the now generally accepted standard adopted by the Water Industry for trace metal analysis. AS

## 83

**Studies on the chemical nature of and bioavailability of As, Cd and Pb in selected marine fishery products.**
Uthe, J. F.; Freeman, H. E.; Sirota, G.; Chou, C. I.
***Abstracts of Papers, American Chemical Society*** **178** (1) AGFD 18 (1979) [En] [Fisheries & Oceans Canada, PO Box 550, Halifax, Nova Scotia, Canada B3J 257]

Current food safety agencies assume that compounds of toxic elements occurring in foods are equitoxic and set tolerances based upon total levels of the toxic element. Research into the nature of naturally occurring As in flatfish has shown that the major form of As is a stable, water soluble, compound rapidly excreted by man in the urine. Little inorganic As was present in fish tissue. A study comparing the bioavailability to rats of 3 dietary forms of Cd ($CdCl_2$/casein; naturally occurring Cd in canned lobster digestive gland and Cd in canned kidney/liver preparation from pigs injected with low doses of $CdCl_2$) showed marked differences in bioavailability in spite of the diets containing equivalent amounts of protein, calories, Ca, Se and Zn. Development of analytical methodology for the determination of tetraalkyl lead compounds in fish products indicated that tetraalkyl lead compounds account for substantial percentages of the total Pb content of these products. AS

## 84

**[Contents of $^{210}$Pb and $^{210}$Po in the food chain cow - milk - cheese.]**
Milosevic, Z.; Horsic, E.; Kljaic, R.; Bauman, A.
*Mljekarstvo* 30 (1) 24-26 (1980) [3 ref. Sh, en] [Vet. Fak., Sarajevo, Yugoslavia]

Samples of 3 food products and of bovine bone s collected in Central Bosnia, Yugoslavia, were examined for $^{210}$Pb and $^{210}$Po. The resp. ranges (pCi/kg) for the 2 elements were 0.10-6.80 and 0-5.2 in beef, 0.20-2.45 and 0.15-2.45 in cows' milk, and 0.00-57.20 and 1.30-3.75 in cheese. Results are compared with those of other workers. FL

## 85

**[Present knowledge of heavy metals in milk and milk products.]** Schwermetalle in Milch und Milchprodukten, gegenwärtiger Stand der Kenntnisse.
Carl, M.
***Landwirtschaftliche Forschung*** Sonderheft 34/I, 95-102 (1978) [16 ref. De, en, fr] [Milchwirtschaftliche Untersuchungs- & Versuchsanstalt, Hirnbeinstrasse 10, D-8960 Kempten, Federal Republic of Germany]

An examination of information on contamination of milk and milk products with As, Pb, Cd, Hg, Sn, Cu and Fe shows considerable variations and analytical errors. The avoidance of errors and suitable estimation methods are discussed. Milk contributes only slightly to the total dietary intake of toxic heavy metals.

Comparisons of Hg estimation by various methods showed the magnitude of systematic errors. Sources of systematic errors and their avoidance are discussed and a modification of Vondenhof & Beindorf's method [FSTA (1976) 8 10C494] is described which avoids systematic errors and allows reliable detection of contaminations. RM

## 86

**Environmental lead contamination.**
Varma, M. M.; Doty, K. T.
***Journal of Environmental Health*** 42 (2) 68-71 (1980) [38 ref. En] [School of Eng., Howard Univ., Washington, DC 20059, USA]

This paper discusses the distribution of Pb to water and food, and the various health effects associated with Pb uptake, under the following headings: Pb in water, sediment, air and food; health effects; placental transfer; and Pb in children. SP

## 87

**[Factors influencing heavy metal contamination of foods.]** Beeinflussung der Schwermetallkontamination von Lebensmitteln.
Bielig, H. J.; Hofsommer, H. J.
***Industrielle Obst- und Gemüseverwertung*** 65 (1) 1-7 (1980) [53 ref. De] [Tech. Univ. Berlin, Königin-Luise-Strasse 22, 1000 Berlin 33]

The contamination of foods with heavy metals is greatly affected by processing. The effects of single processing and other steps (cleaning, blanching, comminution, separating and mixing processes, chemical changes, extension of storage life, packaging and storage) are illustrated by many examples from food processing (sugar refining, winemaking, brewing, distillation, fats and oils refining, meat technology, fruit and vegetable processing). Most of these processes result in decontamination. Special attention is given to cleaning, which has been shown to be particularly effective, e.g. washing and peeling of fruits and vegetables. Apple juice production is considered in detail in relation to changes in Pb contamination. Causes of Pb and Sn contamination in canned products are discussed in relation to pH, product type, storage time and temp., and the type of can. Potentials and limits of technological decontamination methods are reviewed. RM

## 88

**[Tinplate cans for foods - a source of Pb and Sn in foods.]**
Jorhem, L.; Slorach, S. A.
***Var Föda*** 31 (3) 173-191 (1979) [16 ref. Sv, en] [Livsmedelslab., Statens Livsmedelsverket, S-751 26 Uppsala, Sweden]

The significance of cans as a source of dietary Pb and Sn is discussed, with reference to: manufacture of cans; effects of full or partial lacquering of the interior of the cans; solubilization of Pb and Sn; toxicity of Pb and Sn; the significance of lacquer defects, denting of cans, and discoloration of the interior of cans; technical developments for minimization of Pb and Sn uptake by canned foods; and tolerances for Pb and Sn in foods in Sweden. Data are given for Sn and Pb concn. in various fruit and vegetables in wholly-lacquered or partly-lacquered/unlacquered cans, together with comparative values for Pb concn. in fresh and canned fruit and vegetables. Sn concn. were higher for products in unlacquered or partially lacquered cans than for those in fully-lacquered cans. Pb concn. tended to be highest for foods in fully-lacquered cans; Pb concn. in canned fruit and vegetables were $\leq 28$ times as high as those in fresh produce. The soldered seam is the main source of Pb. AJDW

## 89

**[Pb and Cd in enamelled or ceramic household utensils.]**
Beckman, I.; Movitz, J.; Nygren, M.; Slorach, S. A.
***Var Föda*** 31 (3) 193-197 (1979) [Sv, en] [Livsmedelslab., Statens Livsmedelsverket, S-751 26 Uppsala, Sweden]

A brief report is given of studies on extractability of Pb or Cd from 381 decorated ceramic dishes etc., and 23 enamelled items, during holding for 24 h at room temp. in contact with 4% acetic acid. Of the ceramic items, 5 (2%) yielded >0.1 mg Cd/l, 36 (11%) yielded >1 mg Pb/l and 12 (4%) yielded >0.1 mg Cd/l + >1 mg Pb/l. The highest Pb and Cd release values recorded were, resp., 77 mg/l and 7 mg/l. All 23 enamelled items released <0.1 mg Pb/l; 4 released >0.1 mg Cd/l. Implications for food contact applications of coloured ceramic or enamelled utensils are discussed. AJDW

## 90

**[Heavy metal content (As, Pb, Cd, Hg) of vegetables which grow above ground, and fruits.]** Gehalt an Schwermetallen (Arsen, Blei, Cadmium, Quecksilber) in oberirdisch wachsenden Gemüse- und Obstarten.
Barudi, W.; Bieling, H. J.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 170 (4) 254-257 (1980) [5 ref. De, en] [Inst. für Lebensmitteltech. - Frucht- und Gemüsetech. - der Tech. Univ., Königin-Luise-Strasse 22, D-1000 Berlin 33]

157 samples of 16 types of vegetable, whose aerial tissues are consumed, and 83 samples of 6 var. of fruit were examined by AAS for As, Pb and Hg contamination. Leafy vegetables were found to be more heavily contaminated than the other vegetable types. Fruits without exception had less heavy metals than

vegetables. The results obtained were compared with the guide line values of the German regulatory authority ZEBS [Zentrale Erfassungs- und Bewertungsstelle für Umweltchemikalien] and with the recommendations of WHO for weekly tolerance values for Pb, Cd and Hg. It was determined that the average weekly exposure of the population of the Federal Republic of Germany is below the max. tolerance level. AS

### 91

**Lead content of milk and infant formula.**
Walker, B., Jr.
*Journal of Food Protection* 43 (3) 178–179, 184 (1980) [13 ref. En] [School of Human Ecology, Howard Univ., Washington DC 20004, USA]

In a survey in Washington, DC, mean Pb contents in 110 samples of 11 national brands of infant formula, 10 samples of evaporated milk, 10 of homogenized cows' milk, 10 of dried skim milk and 40 of human milk were resp. (µg/ml): 0.05–0.50, 0.30, 0.01, 0.53 (µg/g) and 0.02. Results are discussed with reference to daily permissible intakes of Pb, as yet not firmly established. DMK

### 92

**[Estimation of bismuth and lead in dried milk by a solvent extraction and flameless atomic absorption spectrometry method.]**
Suzuki, T.; Takeda, M.; Uchiyama, M.
*Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]* 20 (3) 198–203 (1979) [13 ref. Ja, en] [Nat. Inst. Hygiene Sci., Kamiyoga 1-chome, Setagaya-ku, Tokyo, Japan]

Dried milk was ashed and the acidic solution extracted with methylisobutylketone (MIBK); metacresol purple was added to the ammoniated aqueous phase. The resulting solution was extracted with sodium diethyldithiocarbamate (DDTC)/MIBK to eliminate the matrix effect observed in direct measurements on acid solutions and the organic layer was injected into the carbon tube. Bi was estimated in the atomized samples at 223.6 nm and Pb at 283.6 nm. Optimium ashing conditions for Bi estimation were 600°C for 80 s and for Pb, 900°C for 25 s; DDTC/MIBK extraction of both metals was at pH 8.0 and atomizing voltages were 9.0 V (2350°C) and 8.0 V (2200°C) resp. Optimum sensitivities for 1% absorption were 3 µg/kg for Bi and 5 µg/kg for Pb, and linear standard curves were obtained for Bi up to 120 µg/kg and Pb up to 100 µg/kg. Coeff. of variation for 10 estimations were 1.9 and 3.4% for Bi and Pb, resp. The presence of chelating metal ions in samples caused some interference, but it was possible to make allowance for this. Recovery of added Bi and Pb from modified dried milk was 95 and 92%, resp.; Bi contents of 10 dried milk samples were 1–13 µg/kg, and Pb contents were 80–240 µg/kg. BWH

### 93

**Biological availability of lead in oysters dosed with lead.**
Stone, C. L.; Fox, M. R. S.; Hogye, K. S.
*Abstracts of Papers, American Chemical Society* 178 (1) AGFD 21 (1979) [En] [Food & Drug Admin., HEW, 200 "C" Street, SW Washington, DC 20204, USA]

The purpose of this study was to determine the bioavailability of Pb physiologically incorporated into oyster meat as compared with inorganic Pb. Newly hatched Japanese quail (10 birds/group) were fed purified diets with 3 levels of Pb (20–116 p.p.m.) added as either lead acetate, as freeze-dried Pb-ladenened oyster or as control oyster + lead acetate. After 2 wk, the tibia showed significant uptake of Pb from either source. Based on this measurement, dietary levels <40 p.p.m. of oyster-bound Pb were more available than Pb as the acetate, but levels between 45 and 116 p.p.m. Pb as oyster were less available. Approximately 42 p.p.m. Pb as either form resulted in equivalent amounts of Pb in the tibia. The combination of control oyster meat with lead acetate gave a response similar to the oyster-bound Pb groups, indicating the effects of the oyster meat. Thus, the presence of oyster meat caused Pb to be metabolized differently from that added as lead acetate alone. Because of intersecting response curves and lack of a common y-intercept, the statistical conditions for either parallel lines or slope ratio assays were not satisfied. An attempt to estimate Pb bioavailability at these dietary levels would be an oversimplification. AS

### 94

**Heavy metal concentrations in the muscle tissue of 12 species of teleost from Cockburn Sound, Western Australia.**
Plaskett, D.; Potter, I. C.
*Australian Journal of Marine and Freshwater Research* 30 (5) 607–616 (1979) [24 ref. En] [Murdoch Univ., Murdoch, WA 6153, Australia]

The wet and dry concn. of Cd, Zn, Cu, Pb, Fe, Mn, Ni, Cr and Co were determined in fillets of muscle tissue from 12 species of commercial teleost caught in Cockburn Sound: sea mullet *(Mugil cephalus)*, yellow-eye mullet *(Aldrichetta forsteri)*, Australian herring *(Arripis georgianus)*, King George whiting *(Sillago punctata)*, yellow-finned whiting *(S. schomburghii)*, cobbler *(Cnidoglanis macrocephalus)*, sea garfish *(Hyporhamphus melanochir)*, tailor *(Pomatomus saltatrix)*, rock flathead *(Platycephalus laevigatus)*, small-toothed flounder *(Pseudorhombus jenynsii)*, skipjack trevally *(Caranx georgianus)*, and six-lined trumpeter *(Pelastes sexlineatus)*. Tabulated results showed max. concn. for each metal to be well below the National Health and Medical Research Council (NHMRC) standards and the W. Australian Food and Drug Regulations values, and many times lower than in invertebrates, e.g. mussels *(Mytilus edulis)*. Highest individual values (µg/g wet wt.) were: Cd 0.18, Zn 21.6, Cu 1.38, Pb 1.24, Fe 14.0, Mn 0.99, Cr 0.36, Ni 0.89, and Co 0.52. RM

### 95

**Concentrations of arsenic, selenium and ten heavy metals in school shark, *Galeorhinus australis* (Mackay), and gummy shark, *Mustelus antarcticus* Günther, from south-eastern Australian waters.**
Glover, J. W.
*Australian Journal of Marine and Freshwater*

*Research* 30 (4) 505-510 (1979) [13 ref. En]

The max. concn. of As, Cd, Cu, Mn, Se and Zn in the edible flesh of *G. australis* and *M. antarcticus* were found to be 30, 0.08, 0.6, 0.6, 0.8 and 4.8 µg/g wet wt. resp. The concn. of Co, Cr, Pb, Mo and Ni were below the limits of detection of the methods used (0.3, 0.5, 0.1, 0.2 and 0.2 µg/g resp.). Samples for analysis were taken from 1 male and 1 female shark of each sp. caught in 6 areas of S.E. Australian waters and wherever possible the concn. of the elements were correlated with the sp., sex and site of capture. (Samples were taken from the largest shark in each sp., sex and locality category). AS

## 96

**[Determination of metals in lemon essential oil.]**
Chiricosta, S.; Calabro, G.; Bruno, E.
***Essenze Derivati Agrumari*** 48 (2) 107-120 (1978) [5 ref. It] [Univ. di Messina, Messina, Italy]

A method is described for detn. of Na, K, Ca, Mg, Zn, Fe, Cu, Pb, Mn, Al and Sn in lemon essential oil by AAS. By using metal-organic standards directly soluble in the essential oil, prior treatment of the samples is eliminated, allowing simple and fast detn. suitable for routine analysis. Tabulated results from 25 genuine Sicilian samples showed highest concn. for Fe (mean 0.795 p.p.m.) and K (mean 0.641 p.p.m.), lowest for Sn (detectable at 0.035-0.090 p.p.m. in 5 samples only), Mn (0.005-0.033 p.p.m.) and Al (0.006-0.110 p.p.m.), and most other metals at 0.030-0.500 p.p.m. Reproducibility (11 replicates of 1 sample) gave coeff. of variation 2.05-6.60%, recoveries 96.8-105.0. RM

## 97

**Cadmium, lead and zinc concentrations in soils and in food grown near a zinc and lead smelter in Zambia.**
Nwankwo, J. N.; Elinder, C.-G.
***Bulletin of Environmental Contamination and Toxicology*** 22 (4/5) 625-631 (1979) [16 ref. En] [Water Quality Lab., Water Resources Res. Unit, Nat. Council for Sci. Res., PO Box CH 158, Chelston, Lusaka, Zambia]

Concn. of Cd and Pb in 29 samples of soil and 39 food samples (maize, spinach, cabbage, rape, lettuce, kaffir corn, and rice) grown close to a Zambian Pb and Zn smelter, the Broken Hill plant in Kabwe, which had been in operation from 1906 to 1975, were investigated. Samples from Lusaka and its suburbs were used as control material. Food samples, 19 from Kabwe region and 20 from the Lusaka region, were analysed. The food materials were oven-dried at 105°C prior to grinding in an Al cast blender, dry-ashed twice at 450°C and analysed by flame AAS. 7 maize samples grown within a 3 km radius of the smelter had Cd concn. ranging from 0.028 to 0.116 µg Cd/g dry wt. and Pb concn. ranging from 0.57 to 1.36 µg/g dry wt. Average Cd concn. was 0.064 µg/g and average Pb concn. was 0.90 µg/g dry wt. Maize samples from Lusaka had considerably lower concn. of Cd ranging from 0.002 to 0.088 µg/g than those grown near the smelter. Cd concn. in 3 samples of fresh vegetables obtained close to the west side of the plant were excessively high i.e. > 1 µg Cd/g dry wt. 2 of the food samples obtained from the Kabwe market had high Cd and Pb concn.; whereas the other 5 samples had low concn. i.e. most probably grown in areas outside Kabwe. Highest Cd concn. were generally recorded in spinach, cabbage and rape. VJG

## 98

**[Comparison of three sample preparation methods for the determination of lead in fruit juices by flameless AAS.]** Vergleich von drei Probenaufbereitungsverfahren für die quantitative Bestimmung von Blei in Fruchtsäften mit der flammenlosen Atomabsorptions-Spektrometrie.
Harbach, D.; Diehl, H.; Timm, J.; Huntemann, D.
***Zeitschrift für Analytische Chemie*** 301 (3) 215-219 (1980) [5 ref. De, en] [Univ. Bremen, Postfach 33 04 40, D-2800 Bremen 33, Federal Republic of Germany]

Comparison of 3 methods of sample preparation, i.e. (i) atomizing in the graphite tube furnace after wet-chemical ashing, (ii) atomizing after high-frequency low-temp. ashing with prior vacuum drying, and (iii) direct ashing in the graphite tube cuvette, showed that no prior digestion is necessary for detn. of Pb in fruit juices. Direct ashing was as reliable as methods (i) and (ii). Analysis of 20 commercial fruit juices (grape, plum, redcurrant, blackcurrant, morello cherry, apple, pear and cherry juice) showed highest Pb contents of 0.211 p.p.m. in a grape juice, i.e. Pb contents of all the juices were below the WHO tolerance limit of 0.3 p.p.m. RM

## 99

**Lead uptake of grapefruit juices stored in cans as determined by flameless atomic absorption spectroscopy.**
Rouseff, R. L.; Ting, S. V.
***Journal of Food Science*** 45 (4) 965-968 (1980) [En] [Florida Dep. of Citrus & Agric. Res. & Education Cent., PO Box 1088, Lake Alfred, Florida 33850, USA]

Effects of juice acidity, storage time and temp. on Pb content of canned grapefruit juice were determined. Freshly processed juice had a Pb concn. of 0.06 p.p.m. Average Pb levels increased to 0.19 p.p.m. after 17 wk storage and did not change significantly thereafter. After 52 wk storage, composite juice Pb concn. ranged from 0.13 to 0.26 p.p.m. These levels are within the FAO/WHO Food Standard Program limits. Storage temp. had no significant effect on ultimate juice Pb concn. The major factor in determining ultimate Pb levels was the surface area of solder exposed to the juice. Juice pH was also a factor with the more acidic juices having a slightly greater Pb content. These findings suggest that measures to reduce interior solder surface area in cans should reduce the Pb content. IFT

## 100

**Contamination of vegetables with heavy metals.** [Lecture]
Fritz, D.; Venter, F.
***Acta Horticulturae*** No. 93, 403-412 (1979) [28 ref. En] [Dep. of Veg. Crops, Tech. Univ. of Munich, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

In order to prepare baseline data for further studies, heavy metals (Zn, Cu, Pb, Ni, Cr, Cd, and in some cases Hg) were determined by AAS in samples of 10 different vegetables from 6 Bavarian areas remote from anthropogenic heavy metal contamination. Additionally, pot trials were conducted in which vegetables were grown with increasing amounts of sewage sludge compost. The investigations showed that heavy metal levels were generally highest in leaves and lowest in fruits. Independent of the vegetable group, the heavy metals were present in decreasing amounts in the order Zn > Cu > Pb > Ni > Cr > Cd > Hg. Pot trials showed that different vegetables react differently to the presence of the sewage sludge with respect to heavy metal uptake. In most cases levels (primarily of Zn and Cu) were elevated more in leaves than in fruits and tubers. Additionally, there seems to be some evidence of plant-specific uptake of some heavy metals. [See FSTA (1980) 12 11J1566.] JRR

## 101

**[Polarographic determination of copper, zinc and lead in refined sugar.]**
Zboril, M.; Kotoucek, M.
***Listy Cukrovarnicke*** 95 (12) 278–280 (1979) [13 ref. Cs, ru, en, de] [Pokusne a Vyvojove Stredisko n.p. Nealko, Olomouc, Czechoslovakia]

The polarographic detn. of Cu, Zn and Pb in raffinade is carried out directly without previous mineralization. The method is rapid, simple, and sufficiently accurate. At a max. content of 40% of sugar in the sample analysed it allows detn. of 1 mg Pb, 1 mg Cu and 0.5 mg Zn in 1 kg of refined sugar. At lower concn. of sugar in the samples analysed the method is more accurate. STI

## 102

**[Lead and cadmium contents in the meat and organs of cattle. II. Cattle from an area of lead contamination.]** Untersuchungen über den Blei- und Cadmiumgehalt in Fleisch und Organen von Schlachtrindern. II. Rinder aus einem bleischüssigen Gebiet.
Kreuzer, W.; Bunzl, K.; Kracke, W.
***Fleischwirtschaft*** 59 (10) 1529–1542 (1979) [48 ref. De, en] [Inst. für Hygiene & Tech. der Lebensmittel Tierischen Ursprungs, Veterinärstrasse 13, 8000 Munich 22, Federal Republic of Germany]

253 Red-and-Black Pied cattle of different ages and sexes were examined for Pb and Cd contents in kidneys, liver and muscle. The animals were taken from (i) heavily Pb contaminated land, from (ii) land regularly flooded by 3 streams draining a Pb contaminated area, and from (iii) land with no obvious Pb contamination. Tabulated results showed <0.05 mg/kg Pb in muscle meat from all 3 groups as well as from a pre-alpine region, group (iv), [see ref.]. Pb contents (95% confidence limits) were in liver, 1.18–1.70 (mean 1.48) mg/kg, 0.84–1.25 (1.12), 0.23–0.34 (0.28) and 0.13–0.15 (0.14); in kidneys 2.30–3.26 (2.69), 1.59–2.10 (1.83), 0.51–0.65 (0.57), and 0.30–0.33 (0.31); kidney:liver ratio 1.8, 1.6, 2.0 and 2.2; kidney:muscle ratio >53.8, >36.6, >11.4 and >6.2; and liver:muscle ratio >29.6, >22.4, >5.6 and >2.6, for groups (i)–(iv) resp. Corresponding Cd contents were: muscle >0.005, liver (groups (i)–(iii)) 0.10–0.16 (0.12–0.13) and (iv) 0.05–0.06 (0.05); kidneys 0.36–0.78 (0.48–0.67) and 0.20–0.26 (0.23); and kidney:liver ratio 5.6, 3.7, 4.5 and 4.6; kidney:muscle ratio >134, >96, >118, >46; and liver:muscle ratio >24, >26, >26, >10, for groups (i)–(iv) resp. On farms feeding large amounts of beets, beet tops and silage, very high Cd and sometimes also Pb contents were found in the organs of $1\frac{1}{2}$ yr old animals. [Continued in following abstr.] RM

## 103

**[Lead and cadmium contents in the meat and organs of cattle. II. Cattle from an area of lead contamination.]** Untersuchungen über den Blei- und Cadmiumgehalt in Fleisch und Organen von Schlachtrindern. II. Rinder aus einem bleischüssigen Gebiet.
Kreuzer, W.; Bunzl, K.; Kracke, W.
***Fleischwirtschaft*** 59 (10) 1529–1542 (1979) [48 ref. De, en] [Inst. für Hygiene & Tech. der Lebensmittel Tierischen Ursprungs, Veterinärstrasse 13, 8000 Munich 22, Federal Republic of Germany]

[Continued from preceding abstr.] Results confirmed earlier findings on correlations of Pb and Cd contents of livers and kidneys, and the dependence of Cd in the organs on the age of the animals; Pb contents in the organs of older animals increased only after prolonged high intake and were more evenly distributed within the body than Cd. Great variations in contents of both metals were observed within the test groups. 'Guide value 79' for Pb in livers (0.8 mg/kg) was exceeded in nearly all livers from (i) and >50% from (ii) animals, and even more in kidneys where 1.0 mg/kg was always exceeded. 'Guide value 79' for Cd in liver (0.5 mg/kg) was exceeded in 7.5% of cases in group (i), 1% in group (iii). Even 1.0 mg/kg as permissible max. was exceeded only in 18% of kidneys from groups (i)–(iv). Possible legal limitations on consumption of kidneys from older animals and from polluted areas are discussed (e.g. utilization in processed meats or for animal feed only). [See FSTA (1979) 11 5S868 for part I.] RM

## 104

**[Volatile solvents and pesticide residues in flavourings.]** [Review]
Peyron, L.
***Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol*** 61 (2) 46–52 (1979) [70 ref. Fr] [Lantier Aromatiques, Grasse, France]

This review discusses problems of solvent, pesticide and heavy metal traces in food flavourings in relation to intake, methods of detn. and health hazards. RM

## 105

**Analysis of foods for lead, cadmium, copper, zinc, arsenic, and selenium, using closed system sample digestion: collaborative study.**
Holak, W.
***Journal of the Association of Official Analytical Chemists*** 63 (3) 485–495 (1980) [14 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

A method for detn. of Cd, Pb, Cu, As, Se and Zn is presented. The method involves digesting a food sample with nitric acid under pressure and using aliquots of the solution for analysis by suitable techniques. Cd, Pb, and Cu are determined by anodic stripping voltammetry (ASV) after heating with equimolar sodium nitrate/potassium nitrate; As and Se are determined by AAS after generation of their respective hydrides; Zn is determined by conventional AAS. The combined recoveries and reproducibilities ($CV_R$) of the collaborative study on this multielement analysis are: Cd, 89.14 (17.65) at 0.10–1.0 μg/g; Zn, 96.53 (5.59) at 16.7 and 66.7 μg/g; As, 99.50 (17.02) at 0.5 and 2.0 μg/g; Se, 95.17 (16.52) at 0.5 and 2.0 μg/g; Pb, 92.57 (15.22) at 0.3–3.0 μg/g; and Cu, 108.39 (18.30) at 1.0–10.0 μg/g. The method has been adopted as official first action for Cd, Pb, As, Se, and Zn.   AS

## 106

**[Contamination of foods with heavy metals.]**
[Review]
Nabrzyski, M.
***Bromatologia i Chemia Toksykologiczna*** 12 (4) 411–419 (1979) [52 ref. Pl] [Zaklad Bromatologii Inst. Chem. i Anal. Akad. Med., Gdansk, Poland]

This review includes tabulated data on daily intakes of Cd and Pb in different countries; contents (ranges and means) of Hg, Cd and Pb in 29 different foods; permitted levels of Hg, Cd and Pb in various foods in different countries; and foods (15) in which high levels of Hg, Cd and Pb may be expected.   HBr

## 107

**X-ray fluorescence method for the estimation of lead in protective tin coatings.**
Nagapal, K. C.; Suri, D. K.; Ali, S. Z.
***Research and Industry, India*** 24 (3) 171–176 (1979) [19 ref. En] [Nat. Physical Lab., New Delhi-110 012, India]

Food is cooked or stored in brass or Cu vessels coated internally with Sn, so that they resist most alkalies and a few acids which may be present in cooked or stored food. During the course of tinning of such vessels Pb is a common adulterant, forming poisonous salts which when transferred to food may lead to chronic Pb poisoning. In order to obviate this difficulty, an X-ray fluorescence method which enables estimation of Pb content from partially removed tin coatings of brass and Cu vessels has been developed. The method involves judiciously timed dissolution of the top layer of coating in dilute $HNO_3$, and estimation of Sn and Pb present in the solution by X-ray fluorescence. Brass vessels tinned by professionals were found to contain 25–50% by wt. of Pb in the coating. The rapid method enables estimation in 15 min.   CFTRI

## 108

**Analysis of wines for metals using atomic-absorption spectrophotometry.**
Harju, K.; Ronkainen, P.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 170 (6) 445–448 (1980) [3 ref. En, de] [Res. Lab. of the State Alcohol Monopoly (Alko), Box 350, SF-00101 Helsinki, Finland]

Ca, Cd, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Pb and Zn were determined using AAS in 59 Finnish ($n = 10$) and foreign ($n = 49$) wines sold in Finland. Cd and Pb were determined in a graphite furnace and the other metals with an air-acetylene flame. All wines contained only low levels of heavy metals; in all cases the concn. of Pb was <0.3 mg/l, that of Cu was <1.0 mg/l, that of Zn was <5.0 mg/l and that of Cd was <0.1 mg/l, which are the max. levels permitted in some countries. Finnish wines contained less Pb and Mg and more Cr and Na than the foreign wines analysed.   AS

## 109

**[Heavy metal contents of canned tomato concentrates.]**
Koncz, I.; Kovaczne Molnar, K.
***Elelmezesi Ipar*** 33 (7) 261–264 (1979) [Hu, en, de, ru] [Konzerv-es Paprikaipari Kutato Intezet, 1097 Budapest, Földvary ut 4, Hungary]

The following problems were investigated in laboratory experiments: what is the relationship between the heavy metal contents of canned tomato concentrates and the type of varnish applied to the inside of the can; are the soldering particles able to dissolve in the tomato concentrate and is this dependent on the quality of the varnish; and what is the period of time after which the heavy metal contents reach the limits of permitted values. Results showed that type of varnish did not affect the amount of dissolved metals in the concentrates; it was dependent entirely on faulty or damaged varnishing. However, the appearance of the inside surface of the can was much better when pigmented (double layer) varnish was used instead of transparent golden one. The soldering particles did not show any loss of wt. for any of the varnish types. The Sn content of the concentrates reached or surpassed the permitted values (250 mg/kg) on the 360th day of storage at 20°C and on the 225th day at 37°C. During storage, the Pb content did not reach the limit of permitted values (3 mg/kg) in any of the samples. The Fe content did not surpass the original values of 30–50 mg/kg, even when iron oxide pigmented varnish was used, except in the case of $TiO_2$ pigmented varnish, where the Fe content increased to 250–350 mg/kg after 360 days of storage at 20°C (at 37°C the cans were also blown by $H_2$).   ESK

## 110

**[Heavy metal contents in homogenized fruit products for infants.]**
Spadoni, S.; Massi, C.; Micozzi, F.; Ruggeri, P.
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** 9 (2) 123–126 (1980) [18 ref. It] [Lab. di Chim., Ufficio d'Igiene & Sanita, Rome, Italy]

Concn. of Pb, Cu, Zn and Cd were determined by AAS in samples of homogenized (i) pears, (ii) apples and (iii) mixed fruit, products of 4 manufacturers. Tables of results are given. Mean values and ranges were (p.p.m.): Pb, (i) 0.138 and 0.065–0.250, (ii) 0.124 and 0.078–0.220, and (iii) 0.110 and 0.060–0.230; Cu, (i) 0.80 and 0.42–1.00; (ii) 0.46 and 0.35–0.63; and (iii) 0.70 and 0.42–1.10; Zn, (i) 1.7 and 1.1–2.9, (ii) 1.2 and 0.45–2.7, and (iii) 1.5 and 0.70–2.3; Cd, (i) 0.0044 and 0.002–0.006, (ii) 0.0037 and 0.002–0.006, and (iii) 0.0070 and 0.003–0.013. The toxicological significance of these heavy metal concn. in foods for infants is discussed.   AJDW

## 111

**[Pesticides, metal residues, antibiotics.]** [Review]
Luquet, F. M.; Mahieu, H.; Mouillet, L.; Boudier, J. F.
***Alimentation et la Vie*** 67 (2) 73–90 (1979) [30 ref. Fr] [ISHA, BP 138, Champlan, 91160 Longjumeau, France]

This review considers organochlorine pesticides, polychlorinated biphenyls, metals (Cu, Fe, Mn, As, Cd, Hg and Pb) and antibiotics residues in milk in France. Regional and seasonal variations are discussed. Mention is also made of the high contamination of human milk with organochlorine pesticide residues. MEG

## 112

**Rapid routine determination of the lead content of sterilized canned evaporated milk by flameless atomic absorption spectrophotometry.**
Koops, J.; Westerbeek, D.
***Netherlands Milk and Dairy Journal*** 34 (1) 31–41 (1980) [5 ref. En, nl] [Netherlands Inst. for Dairy Res. (NIZO), Ede, Netherlands]

A method is described for detn. of Pb in sterilized canned evaporated milk by flameless atomic absorption spectrophotometry. Representative (weighed) 300 µl samples are diluted with a solution of ammonium nitrate and injected by an auto-sampling system into a zirconium-coated graphite tube. Peak heights are compared with those of standards having the same milk matrix. Average values found for Pb in 12 samples of sterilized canned evaporated milk agreed with those obtained by a spectrophotometric (dithizone) procedure. AS

## 113

**Determination of lead and cadmium in fish and clam tissue by atomic absorption spectrometry with a molybdenum and lanthanum treated pyrolytic graphite atomizer.**
Poldoski, J. E.
***Analytical Chemistry*** 52 (7) 1147–1151 (1980) [21 ref. En] [US Environmental Protection Agency, 6201 Congdon Boulevard, Duluth, Minnesota 55804, USA]

A Mo- and La-treated pyrolytically coated graphite tube was employed for furnace AAS of Pb and Cd directly in nitric-perchloric acid tissue digests. La tended to promote the formation of a smooth Pb atomization peak for aid in peak quantitation. Both Mo and La helped reduce chemical interference and interference from uncompensated background signals during analyte atomization. Under typical conditions, average analytical recoveries were 90–110% for both Pb and Cd, and peak height reproducibility was about 2–3% when working sufficiently above detection limits. Accuracy of the method was assessed by analysing NBS SRM (standard reference material) 1577 bovine liver and performing alternate determinations by anodic stripping voltammetry. AS

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FAB 28

# CONTENT AND ANALYSIS OF LEAD IN FOODS

SELECTED FROM VOLUME 13
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

**under the direction of:-**

Commonwealth Agricultural Bureaux, Farnham Royal, Slough; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

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Some of the larger FABs have been divided into sections to facilitate use. FAB 47 also has a subject and author index provided.

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

EDITOR

## 1

**[Symposium 1978. Current state and achievements of chemical and biological agricultural research.]**
Kongressband 1978. Stand und Leistung agrikulturchemischer und agrikulturbiologischer Forschung. [Conference proceedings]
**Germany, Federal Republic of, Verband Deutscher Landwirtschaftlicher Untersuchungs- & Forschungsanstalten (VDLUFA)**
***Landwirtschaftliche Forschung*** Sonderheft 35, 724pp. (1979) [De, en, fr]

The 90th VDLUFA meeting, held in Augsburg on Sept. 18–22, 1978 included the following lectures: Demands of nutrition medicine on the quality of plant foods, by G. Wolfram (pp. 32–42, De, en, fr, 12 ref.). Fertilization and food quality of different cropping systems, by A. Finck (pp. 122–132, De, en, 18 ref.). Uptake of heavy metals by various cultivated plants in a pot trial with a soil of high Cu content, by A. Wünsch, A. Amberger and R. Gutser (pp. 326–334, De, en, fr, 14 ref.). Uptake of heavy metals by various plants in a pot trial from soils with long-term or single application of sewage sludge, by R. Gutser, A. Amberger and A. Wünsch (pp. 335–349, De, en, fr, 32 ref.). Another 19 papers are abstracted individually in FSTA, and are listed in the author index under Germany, Federal Republic of, Verband Deutscher Landwirtschaftlicher Untersuchungs- & Forschungsanstalten (VDLUFA) [90th Symposium]. AJDW

## 2

**[Determination of heavy metals in biological materials using anodic stripping voltametry. IV. Determination of lead and copper in some starchy, milk and fruit products.]**
Repusic, I.; Tkalcec, M.; Piljac, I.
***Prehrambeno Tehnoloska Revija*** 16 (2) 40–47 (1978) [6 ref. Sh, en] [Tvornica Farmaceutskih Proizvoda 'Pliva', Zagreb, Yugoslavia]

Mean and overall mean values (µg/g) with error estimates are tabulated for replicate (3 × 3) determinations of Pb and Cu in 46 different Yugoslav food products based on cereals, flours, syrups, soybeans, vegetables and fruit alone or combined or in combination with milk (13 preparations). None of the contents exceeded the permitted value range of the WHO/FAO Codex Alimentarius Commission. SKK

## 3

**Potential hazard from newspaper as fuel for grilling food.**
Lao, Y. J.; Blackwell, F. O.
***Journal of Environmental Health*** 42 (4) 197–198 (1980) [7 ref. En] [Dep. of Environmental Health, E Carolina Univ., Greenville, N. Carolina, 27834, USA]

3 hamburger patties, 4 in diam., were cooked on a 'Newspaper Grill' using either (i) charcoal, (ii) black-ink newspaper or (iii) coloured-ink Sunday comics as the heating medium. Hamburgers were cooked to approx. well done in 4–5 min with (ii) and (iii) but took 15 min with (i); (iv) a control was cooked in an oven. 25-g samples were taken from the cooked hamburgers, dried at 140°C followed by 500°C, and then cooled to room temp. Nitric acid was added to samples and evaporated to dryness. Samples were heated again to 500°C for 1 h and then 1N HCl added to dissolve the ash. Pb contents were analysed by AAS at 217 nm. Pb contents of (i)–(iv) resp. were, 0.44, 0.53, 0.72 and 0.29 p.p.m. SP

## 4

**[Brief report on field experiments with town waste compost and sewage sludge. Heavy metals in crops.]**
Ein Kurzbericht über langjährige Feldversuche mit Müllkomposten und Klärschlämmen. Schwermetallgehalte in der Erntemasse. [Lecture]
Kick, H.; Poletschny, H.
***Landwirtschaftliche Forschung*** Sonderheft 35, 412–418 (1979) [5 ref. De, en, fr] [Agrikulturchemisches Inst. der Univ. Bonn, Meckenheimer Allee 176, D-5300 Bonn 1, Federal Republic of Germany]

Effects of urban waste application on heavy metals in soil and crops were studied. Tabulated data showed that the metal contents in fodder beets, sugar beets, potatoes and grain maize were not increased in field experiments on 3 different soils for periods of 20, 9 and 6 yr after application of 98 t/ha over 20 yr, 1800 t/ha in a single application, or up to 250 $m^3$ liquid sewage sludge/ha. [See FSTA (1981) 13 1A3.] RM

## 5

**[Release of Pb and Cd from ceramic and enamelled household utensils.]**
Beckman, I.; Movitz, J.; Nygren, M.; Slorach, S.
***Var Föda*** 31 (suppl. 1) 80pp. (1979) [20 ref. Sv, en] [Livsmedelslab., Statens Livsmedelsverk, S-751 26 Uppsala, Sweden]

Studies were conducted on release of Cd and Pb from 381 glazed ceramic dishes etc. and 23 enamelled items. Most samples were tested by a technique involving extraction with 4% acetic acid for 24 h at room temp.; modified extraction methods were also evaluated. Pb and Cd were determined in the extracts by AAS. Tables of results are given. Of the glazed ceramic items, 5 released >0.1 mg Cd/l but <1 mg Pb/l, 36 released >1 mg Pb/l but <0.1 mg Cd/l, and 12 released both >1 mg Pb/l and >0.1 mg Cd/l. Of the enamelled items, 4 released >0.1 mg Cd/l; none released more than 1 mg Pb/l. The toxicological significance of these results is discussed and recommendations to consumers are given. AJDW

## 6

**Physicochemical speciation of lead in drinking water.**
Harrison, R. M.; Laxen, D. P. H.
***Nature, UK*** 286 (5775) 791–793 (1980) [16 ref. En] [Dep. of Environmental Sci., Univ. of Lancaster, Lancaster LA1 4YQ, UK]

The speciation of Pb was determined experimentally in 3 different tapwaters: (i) Lancaster University tapwater, well flushed, Cu piping with high Pb soldered joints, (ii) Bentham tapwater, 1st flush, Cu piping but Pb service pipe, and (iii) Glasgow tapwater, 1st flush, Pb-lined tank and Pb piping. Both (ii) and (iii) were of rather low alkalinity and pH, i.e. aggressive in respect of plumbosolvency. Samples were filtered through Nuclepore filters of pore-size ranging from 0.015 to 12 µm. Total metal concn. in each filtrate were determined by flameless atomic absorption for Fe and Mn, and by anodic stripping voltammetry (ASV) for Pb and Cu following UV-ray acid digestion. Results are presented for Pb, Cu, Fe and Mn concn. in the different size fractions and in ASV-labile, chelex-labile and acid ASV-labile forms. Glasgow water contained the highest concn. of total Pb (372 ng/ml) and the highest % of ASV-labile Pb (63%). In all 3 waters there was little or no free ionic Pb. A significant portion of Pb existed in the colloidal size fractions, associated with hydrous iron oxides or organic macromolecules depending on the composition of the water. There was some particulate Pb in the 1–12 μm size range, but little or none in particles > 12 μm which could have resulted from flaking from the Pb water pipes. Plumbosolvency control is discussed. The health implications of the findings are uncertain, but at pH 1–2 in the acidified samples, all Pb is ASV-labile and is probably present as free metal ions. Hence at the pH of the stomach, tapwater Pb may also take this form and be more available for absorption than Pb bound in foods, which may explain the effectiveness of removal of Pb piping in reducing blood Pb levels. AL

## 7

**[Use of composted urban wastes in viticulture. Partial results from 3 year trials.]** Einsatz von kompostierten Siedlungsabfällen im Weinbau. Teilergebnisse nach 3 Versuchsjahren. [Lecture]
Pfulb, K.; Völkel, R.; Enkelmann, R.; Scholl, W.; Wiechens, E.
*Landwirtschaftliche Forschung* Sonderheft 35, 377–393 (1979) [8 ref. De, en, fr] [Staatliche Landwirtschaftliche Untersuchungs- & Forschungsanstalt, Augustenberg, Postfach 41 09 43, D-7500 Karlsruhe 41, Federal Republic of Germany]

Effects of 3 yr application of a total of 150, 300 and 600 t composted urban wastes/ha to acid and alkaline vineyard soils were investigated. Tabulated results showed no significant increases in heavy metal concn. (Mn, Zn, Cu, Pb, Cd, Hg) in musts and wines at any level of application and on any soil. In all cases the levels of heavy metals in wine were far below legal tolerance levels: concn. in musts were: Cu, 0.2–0.4 p.p.m.; Zn, 0.4–1.2 p.p.m.; Pb, 0.03–0.10 p.p.m.; Cd, 0.8–1.3 parts/billion; Hg, 0.04–0.16 parts/billion; and Mn, 1.6–2.3 p.p.m. Levels in wines were generally lower. [See FSTA (1981) 13 1A3.] RM

## 8

**Determination of lead in drinking waters by hydride generation and atomic-absorption spectroscopy, and three other methods.**
Vijan, P. N.; Sadana, R. S.
*Talanta* 27 (4) 321–326 (1980) [10 ref. En] [Lab. Services Branch, Ontario Min. of the Environment, 125 Resources Road, Rexdale, Ontario, Canada]

Simultaneous presence of Cu and Ni in potable waters interferes with the detn. of Pb at trace levels by the hydride AAS method. This interference is eliminated by co-precipitating Pb with manganese dioxide from acidic solution. The precipitate is dissolved in 0.85% nitric acid and analysed by the automated hydride-AAS method. This method was applied to 22 representative water samples and results compared with those obtained by using differential pulse anodic-stripping voltammetry, flame atomic-absorption and graphite-furnace AAS. The precision of the 3 methods is reported and their accuracy checked by the analysis of reference standard water samples. The sensitivity of the 3 methods is of the order of 1 μg/l compared to 100 μg/l for flame atomic-absorption. The merits of each method are discussed. AS

## 9

**[Pb and Cd in sugar.]** Blei- und Cadmiumgehalt in dem 'Grundnahrungsmittel: Zucker'.
Matter, L.
*Lebensmittelchemie und Gerichtliche Chemie* 34 (3) 79 (1980) [1 ref. De] [Chem. & Lebensmitteluntersuchungsamt der Stadt Duisburg, Pulverweg 39, 4100 Duisburg, Federal Republic of Germany]

Pb and Cd were determined by flameless AAS in 15 samples of sugar of various types, including sugar cubes, brown candy sugar, coarsely-granular sugar, granulated sugar refined white sugar (from France, Belgium and the Netherlands) and Irish coffee sugar. Mean Pb concn. was 0.103 p.p.m.; Pb concn. ranged from 0.055 p.p.m. for Belgian refined sugar to 1.60 p.p.m. for brown candy sugar. Mean Cd concn. was 0.016 p.p.m.; Cd concn. ranged from 0.008 p.p.m. for Netherlands refined sugar to 0.027 p.p.m. for French refined sugar and Irish coffee crystals. AJDW

## 10

**Heavy metal concentrations in major fractions of corn kernels.**
Hinesly, T. D.; Sudarski-Pack, V.; Ziegler, E. L.; Kinder, D. H.
*Prehrambeno Tehnoloska Revija* 16 (1) 2–5 (1978) [4 ref. En, sh] [Dep. of Agronomy, Univ. of Illinois, Urbana, Illinois, USA]

3 single-cross maize cv. known to produce grain with resp. low, intermediate and high concn. of Cd when grown on soils enriched with sludge-borne Cd were grown in a field reclaimed from strip-mined spoil and fertilized with anaerobically digested sewage sludge during 5 yr. Samples of grain were collected from 9 separate 3-m lengths of row for each single cross. Mean values with s.e. are tabulated for Cd, Zn, Cu, Ni, Mn, Cr, Fe and Pb contents determined by flame AAS and Hg determined by cold vapour AAS in whole kernels, endosperm and remainder of kernel, defatted germ, and oil of the 3 cv.; and, for comparison, for a commercial maize germ flour. Mean contents of Cd in whole grain DM were, resp., 0.30, 0.65 and 0.93 mg/kg. Contents of Zn, Pb and Cr were also markedly higher than in grain produced in normal environments: they were resp., Zn 47.1, 41.2 and 27.3 mg/kg, Pb 1.76, 2.12 and 1.41 mg/kg, and Cr 0.52, 0.80 and 0.64 mg/kg. Of the fractions, germ showed highest accumulations of heavy metals. SKK

## 11

**[Heavy metal content of hen eggs.]** Zum Schwermetallgehalt von Hühnereiern.
Weigert, P.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 171 (1) 18–19 (1980) [9 ref. De, en] [Vet.-Untersuchungsstelle der Bundeswehr VI, Schleissheimer Strasse 416, D-8000 München 45, Federal Republic of Germany]

Heavy metal contents of hen egg yolk, white and shell (75 eggs) were determined, after freeze-drying of samples followed by wet digestion, by AAS. Moisture contents of egg white and yolk were 88% and 49%, resp. Mean contents and s.d. (in parenthesis) in yolks and whites, resp. were (p.p.m. dry wt.) Pb 0.067 (0.088), 0.085 (0.058); Cd 0.028 (0.049), 0.023 (0.023); Hg 0.006 (0.004), 0.005 (0.002); As 0.348 (0.316), 0.209 (0.180); Se 0.567 (0.544), 0.376 (0.388). No correlations were found between individual metals or between egg components. Systematic monitoring of contents of As, Se and Cd in eggs is recommended. DIH

## 12

**[Square-wave polarographic determination of copper, lead, cadmium, zinc and tin in food.]** Bestimmung von Kupfer, Blei, Cadmium, Zink und Zinn in Lebensmitteln mittels Square-wave-Polarographie.
Borus-Böszörmenyi, N.
***Nahrung*** 24 (3) 295–302 (1980) [5 ref. De, en, ru] [Cent. Authority for Food Control & Testing, Min. for Agric. & Food, Budapest, Hungary]

Studies on detn. of Cu, Pb, Cd and Zn in foods by square-wave polarography are described. No interference between these metals was observed in simultaneous analyses. Co and Mn do not interfere with Zn detn.; Ni interferes only at concn. higher than those likely to occur in foods. Average recovery is 96.7% for Zn, 100.2% for Cd. Comparative studies on detn. of Cu and Pb in tomato puree by this method and by the Hungarian standard photometric procedures showed close agreement. It is concluded that square-wave polarography is a rapid, accurate and sensitive technique for detn. of heavy metals in foods. IN

## 13

**[Reduction of contamination in tin cans soldered with a high-lead solder. I.]**
Barbieri, G.; Besson, R.; Colli, E.; Leoni, C.; Marchesini, D.; Donati, N.; Rosso, S.; Aldini, R.; Zanotti, A.
***Industria Conserve*** 55 (1) 39–46 (1980) [It, en] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

First results are given from a series of investigations on the origin of Pb contamination in foods canned in conventional tinplate cans. Solubilization of Pb from the internal surfaces was by 2% acetic acid solution. 80–90% of the solubilized Pb was found to come from the side seam, and in particular about 60% from the seam laps. When the internal surface of the cans was lacquered (post-solder), solubilization decreased by ≥70%, the distribution of the release areas remaining much the same. AS

## 14

**[Release of lead in tin cans of tomato concentrate.]**
Aldini, R.; Leoni, C.; Zanotti, A.; Bellucci, G.
***Industria Conserve*** 55 (1) 36–38 (1980) [3 ref. It, en] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

Release of Pb was studied in small cans of tomato concentrate (70, 155 and 400 g net wt., 28% TS) with the lock seam soldered with 2:98 Sn/Pb or pure Sn solder. The Pb concn. was determined during 52 months (70 and 155 g) or 24 months (400 g) storage at room temp. Results, shown graphically and in tables, revealed particularly high Pb release between the months 12 to 18 (70 g pack) and 12 to 24 (155 g pack), and a steep linear rise in the 400 g pack. The concn. of Pb (p.p.m.) at 24 months with increasing can size was 2.28, 1.91 and 1.31; total rise of Pb/can was 145, 272 and 452 g/can. The high concn. of Pb in the product in the smallest can was due to the surface: vol. ratio. 40% of the released Pb came from the seam laps. RM

## 15

**Differential response of sugar beet *Beta vulgaris* L. cultivars to lead.**
Gerakis, P. A.; Veresoglou, D. S.; Sakellariadis, S. D.
***Environmental Pollution, A*** 21 (1) 77–83 (1980) [40 ref. En] [Lab. of Ecology, School of Agric. & Forestry, Aristotelian Univ., Thessaloniki, Greece]

Pb present in soil accumulates more in plant roots than in tops; this study was undertaken with 4 sugar beet cv. to determine possible differences in yield characteristics and Pb concn. in roots. A field experiment was carried out with soil applications of 0, 2 and 20 g Pb/m$^2$, with no fertilizer application. Fresh and dry wt. of roots and tops and sucrose and Pb content of roots were recorded. 2 greenhouse experiments were used to determine an index of lead tolerance (IT) for 8 plant characteristics (characteristic in solution with Pb/without Pb × 100). Effects of Pb were found only at the 20 g/m$^2$ concn., at which all cv. accumulated Pb in roots. The highest Pb content found in the dry roots was 4.8 p.p.m. ELC

## 16

**[Lead, cadmium, arsenic and zinc contents in fish from uncontaminated and contaminated inland waters.]** Blei, Cadmium-, Arsen- und Zinkgehalte von Fischen aus unbelasteten und belasteten Binnengewässern.
Holm, J.
***Fleischwirtschaft*** 60 (5) 1076–1083 (1980) [9 ref. De, en] [Staatl. Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, D-3300 Braunschweig, Federal Republic of Germany]

Within the framework of a plan for water management, and with reference to a fish re-stocking programme, the metal contents in the muscles and livers of fish from unpolluted and polluted still waters, and from unpolluted, polluted and heavily polluted running waters were determined by wet digestion and AAS. Tabulated results showed much greater metal accumulation in livers than in muscles: in perch and roach, Pb contents of liver were 3–11 ×, and Cd contents 90–600 × as high as in muscle. Metal contents in fish tended to rise with water pollution levels but differed with species. Max. contamination was found in perch, with 0.08 and 0.9 mg Pb/kg in muscle and liver resp., and 0.1 and 62 mg Cd/kg; moderate levels were found in roach, chub and tench with 0.03 and 0.12–0.26 mg Pb/kg, 0.05 and 1.0–7.8 mg Cd/kg in muscle and liver resp. Silver bream and pike came within the lowest range, with 0.01–0.03 and 0.04–0.15 mg Pb/kg, 0.007–0.02 and 0.3–1.5 mg Cd/mg, resp. A clear gradation with the distance from the immission source was also observed with the contamination levels in perch and roach at a distance of 30 km dropping to 1/10 that at 12–15 km, and to 1/100 at a distance of 70 km. The 0.5 mg Pb/kg tolerance level was exceeded only in the muscle of fish caught in 2 places from polluted and heavily polluted water, but Cd contents were above the 0.05 mg/kg tolerance level in 90% of fish muscle from heavily polluted and 29–39% from polluted water. As, Zn and Cu levels are also shown in tables but are not included in discussion of the results. RM

## 17

**[Cd contamination in the food chain: water-plankton-fish in the Baltic.]** Zu Fragen der Cadmiumkontamination in der Nahrungskette: Wasser-Plankton-Fisch in der Ostsee.
Manthey, J.; Baugmann, L.; Berge, H.
***Wissenschaftliche Zeitschrift der Universität Rostock*** **27** (6) 629–632 (1978) [6 ref. De, en, fr, ru] [Bezirks-Hygiene-Inst., Stephanstrasse 18, 25 Rostock, German Democratic Republic]

Cd, Pb and Hg levels monitored in Baltic waters, plankton and fish were used to calculate accumulation factors related to the concn. in the water. Mean values found in cod, flounder and herring, resp., i.e. 3.6, 3.7 and 18.1 µg/kg Cd, 38.9, 69.9 and 60.3 µg/kg Pb, 49.4, 82.3 and 80.8 µg/kg Hg are discussed in relation to age, fishing grounds and feeding type. RM

## 18

**[Simultaneous determination of Cu, Fe, Mn, Zn, Pb and Cd in plant tissues by differential pulse polarography.]** Die gleichzeitige Bestimmung von Cu, Fe, Mn, Zn, Pb and Cd in Pflanzengewebe mittels Differential-Puls-Polarographie.
Wisser, K.; Wöhrle, G.
***Mikrochimica Acta*** **I** (1/2) 129–138 (1980) [3 ref. De, en] [Inst. für Lebensmittelchemie der Univ., Kaiser-Strasse 12, D-7500 Karlsruhe, Federal Republic of Germany]

The detn. of Cu, Pb, Cd, Zn, Fe and Mn ions in plant material by differential pulse polarography in a single operation is described. Cu, Pb, Cd and Zn can be determined after incineration and dissolution in tartaric acid; Cd, Zn and Fe after addition of $NH_3$, Mn after further addition of KCN. Sample size required is 0.2–0.5 g, limit of detection is about 1 µg/g. The method is especially suitable for serial analyses. [From En summ.] RM

## 19

**[Determination of Pb, Cd, Cu and Zn in ground water and tap water by anodic stripping voltammetry.]** Inversvoltammetrische Bestimmungen von Blei, Cadmium, Kupfer und Zink in Grundwasser und Leitungswasser.
Frimmel, F. H.; Immerz, A.
***Zeitschrift für Analytische Chemie*** **302** (5) 364–369 (1980) [11 ref. De, en] [Tech. Univ. Marchioninstrasse 17, D-8000 München 70, Federal Republic of Germany]

Heavy metals in ground water and tap water can be determined by differential pulse anodic stripping voltammetry (DPASV), as shown by the quality of analytical results and by comparison with AAS. Concn. of 0.1 µg/l were detectable. The results were affected by sampling method (ground water) or by the residence time in domestic pipes: up to 10 × the concn. was reached in stagnant as in freely running water. Water temp. was a useful aid for evaluation. [From En summ.] RM

## 20

**[Analysis of water samples for heavy metals by means of automated atomic absorption spectrometry.]** Untersuchung von Gewässerproben auf Schwermetalle mit der automatisierten Atomabsorption.
Kempf, T.; Sonneborn, M.
***Bundesgesundheitsblatt*** **23** (1/2) 4–6 (1980) [4 ref. De, en] [Inst. für Wasser-, Boden- & Lufthygiene des Bundesgesundheitsamtes, Corrensplatz 1, 1000 Berlin 33]

Under German-Netherlands cooperation arrangements, work has been performed on the analysis of traces of heavy metals such as Pb, Cd, Cr, Fe, Cu and Zn some of which are toxic, in water. AAS is seen as a selective and sensitive method, since it permits a large degree of automation, and enables processing of a sufficiently large number of samples in the time available. Aspects of proportional sampling from flowing waters, and the preparation of samples, are discussed. Average values of trace elements measured in the lower Rhine are recorded. AS

## 21

**[Pb and Cd contents of sour cherries, in relation to industrial processing after mechanical harvest.]** Blei- und Cadmiumgehalte von Sauerkirschen im Hinblick auf die industrielle Weiterverarbeitung nach maschineller Ernte.
König, R.; Beckmann, G.; Lauterbach, K.
***Nahrung*** **24** (7) 673–675 (1980) [14 ref. De] [Bezirks-Hygieneinspektion & Bezirks-Hygiene-Inst., Erfurt, German Democratic Republic]

Mechanized harvest of cherries may result in considerable losses of juice during transport; when such fruit is to be used for juice production, it is desirable to omit fruit washing before further processing. This might, however, lead to excessive carry-over of Pb or Cd from the fruit surface into the finished product. Investigations were therefore conducted on Pb and Cd concn. in washed and unwashed cherries. Mean values (with ranges in parentheses) were, for unwashed and washed cherries resp. (µg/kg fresh wt.): Pb 41.9 (24.6–62.4) and 28.2 (14.9–51.9); and Cd 6.1 (1.3–13.9) and 3.2 (1.0–8.9). It is concluded that Cd and Pb concn. in the unwashed fruit presented no significant health hazard. IN

## 22

**Application of X-ray fluorescence spectrometry to the study of the marine environment.**
Toussaint, C. J.; Boniforti, R.

***International Journal of Environmental Analytical Chemistry*** 6 (3) 217–228 (1979) [9 ref. En] [Joint Res. Cent., Ispra Establishment, Commission of the European Communities, 21020 Ispra, Italy]

In connection with the possibility of using X-ray techniques for examining pollution of the marine environment by heavy metals, this paper reports a preliminary study which used X-ray fluorescence spectrometry to determine Cr, Cu, Fe, Mn, Ni, Pb and Zn in surface water, fish, shellfish and sediment obtained from the Mediterranean Sea and in air obtained from the coastal area near La Spezia (Italy). The fish and shellfish mostly originated from an area around Sardinia and included the following: *Tellinacea, Tellina, Pinna nobilis, Sepia officinalis, Maena maena, Mullus surmuletus, Torpedo marmorata, Scorpena porcus* and *Mytilus edulis.* Details of the experimental procedures used are given; the X-ray equipment used was an SRS-1 sequential spectrometer with a PDP-8 digital computer, the X-ray diffraction diagram being obtained by a Philips diffractometer. Levels of the 7 heavy metals found in the various samples are tabulated, e.g. for the soft parts of *M. edulis* (µg/kg dry wt.): Cu 4.7 × $10^3$, Cr 50, Fe 149 × $10^3$, Zn 50, Pb 3 × $10^3$, Ni 50, Mn 50. On the basis of the results obtained, modifications to the experimental procedures are suggested. JA

## 23

**[Lead, cadmium and arsenic contents in organ samples of sheep from an arid zone, e.g. Algeria.]** Blei-, Cadmium- und Arsengehalte in Organproben von Schafen aus einer ariden Klimazone am Beispiel Algerien.
Holm, J.; Elsarnagawy, D.
***Fleischwirtschaft*** 60 (7) 1387–1388 (1980) [7 ref. De, en] [Staatliches Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, D-3300 Braunschweig, Federal Republic of Germany]

116 merino sheep from 3 different areas of Algeria where there are few or no emissions were examined for Pb, Cd and As concn. in the muscle, liver and kidneys. Tabulated results (mg/kg for mean and range) were: muscle (1 location only) – Pb 0.009, 0–0.17; Cd 0.010, 0.001–0.023; As 0.002, 0.001–0.004; liver (2 locations) – Pb 0.096, 0.024–0.183 and 0.101, 0.006–0.251; Cd 0.050, 0.017–0.075 and 0.078, 0.022–0.200; As 0.007, 0.004–0.013 and 0.006, 0.002–0.010; kidney (3 locations) – Pb 0.204, 0.035–0.622; 0.224, 0.075–0.493; 0.190 (2 samples only); Cd 0.089, 0.010–0.154; 0.238, 0.042–0.535; 0.151 (2 samples); As 0.006, 0–0.025; 0.007, 0.004–0.017; 0.008 (2 samples). The Pb concn. in the livers were 3–4 times lower than those found in Bavaria [see *Fleischwirtschaft* (1979) 59, 241], but other values were not significantly different, showing that some metal contamination is inevitable. No regional differences in contamination were observed although the distances between sampling points were about 800 km. RM

## 24

**[Residue studies in Austria. III. Heavy metal pesticide and antibiotics residues in slaughter animals from Lower Austria.]** Rückstandsuntersuchungen in Österreich. III. Untersuchungen über Schwermetall-, Pestizid- und Antibiotikarückstände in Schlachttieren aus Niederösterreich.
Jarc, H.
***Wiener Tierärztliche Monatsschrift*** 67 (4) 133–136, 138 (1980) [6 ref. De, en] [Bundesanstalt für Virusseuchenbekämpfung bei Haustieren, Emil-Behring-Weg 3, A-1231 Vienna, Austria]

Meat, fat, liver and kidney samples of 24 cattle and 46 pigs from Lower Austria were analysed for antibiotics, chlorinated hydrocarbons, Pb, Cd and Hg contents. No antibiotics were detected by an inhibition test with *Bacillus subtilis.* Tabulated results of GLC analysis showed all pesticides to be well below the tolerance limits, though a slightly increased concn. of DDT was found in pork fat (max. 235 parts/billion fresh wt. basis). AAS detn. showed overall up to 13, 29 and 11% of Pb, Cd and Hg levels resp. to be above the max. suggested by the Federal Institute of Health of the Federal Republic of Germany (0.8, 0.1 and 0.02 p.p.m. resp.). [From En Summ.] [See FSTA (1980) 12 6S937 for part II.] RM

## 25

**[Heavy metals in aroma compounds.]**
Cottalorda, A. M.; Senaux, M. S.
***Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol*** 61 (5) 195–201 (1979) [32 ref. Fr] [Lautier Aromatiques, Grasse, France]

This review discusses sources of trace metals in flavour compounds; toxicological problems; international standards in foods, food additives and flavours; methods of detn. for As, Cd, Pb; Codex Alimentarius and French limits for As, Cu, Cd, Hg, Fe, Pb and Sn; FDA limits for As, Cu, Pb and Zn, Sb, Cd, F, Hg, Se and Sn; and mean annual consumption/capita in France of Cd from flavours and foods in various groups of food are appended. RM

## 26

**Lead and cadmium contamination during acid preservation of water samples.**
Calabrese, E. J.; Tuthill, R. W.; Sieger, T. L.; Klar, J. M.
***Bulletin of Environmental Contamination and Toxicology*** 23 (1/2) 107–111 (1979) [1 ref. En] [Univ. of Massachusetts, Amherst, Massachusetts 01003, USA]

A comparison of data relating to service system water samples revealed strikingly different values for Pb and Cd values between the 1977 and 1978 studies involving 2 communities (1 with high Na concn. and 1 with low Na concn.). The elevated levels of Pb and Cd can be explained in part via the contamination of samples by the acid ampoules with Pb and Cd based paint. It is recommended that laboratories doing similar analyses noting discrepancies in analytical results should re-examine the manner in which samples were preserved. Nitric acid ampoules used for sample preservation should not contain any potential contamination especially at the 'break off' point of the ampoule. VJG

## 27

**[Factors influencing the behaviour of solders in tinplate containers.]** Faktoren, die das Verhalten von Loten in Weissblechbehältern steuern.
Warwick, M.; Müller, B. F.
***Verpackungs-Rundschau*** 31 (1, Tech.-Wiss. Beil.) 1-4 (1980) [7 ref. De, en]

The rapid test method developed by the International Tin Research Institute, for investigation of simulated solder activity in tinplate cans is described. Tinplate samples contained in closed glass containers are immersed in an electrolyte, e.g. citric acid. The solder, in pellet form, is immersed in the electrolyte, either in direct electrical contact with (coupled) or separated from (isolated) the tinplate sample. The gas in the container headspace is not defined. Results show that $O_2$ concn. in the headspace influences Pb migration from the solder into the food product. Pb migration was low, specially with a combination of unlaquered tinplate and low $O_2$ concn. in the headspace; under these conditions Sn and Fe form a protective layer round the solder. Isolated solder-tinplate combinations caused higher Pb migration into the solution than coupled combinations. Solder composition and storage temp. had little effect on Pb migration for unlaquered samples. Solders containing 98% Pb and 2% Sn are most common. Pure Sn is only used when extremely low Pb concn. are required (infant food cans). In practice, Pb contents generally lie below max. permissible levels. IN

## 28

**[Voltammetric determination of toxic trace metals in wine.]** Die voltammetrische Bestimmung toxischer Spurenmetalle im Wein.
Golimowski, J.; Nürnberg, H. W.; Valenta, P.
***Lebensmittelchemie und Gerichtliche Chemie*** 34 (5) 116-120 (1980) [17 ref. De] [Inst. Angewandte Physikalische Chem., Kernforschungsanlage, 5170 Jülich, Federal Republic of Germany]

Voltammetric methods of detn. of toxic metals (Cd, Pb, Cu, Hg, Co, Ni) in wines are described. Before analysis dissolved organic constituents of the wine samples are decomposed (and bound trace metals liberated) by UV photolysis in the presence of $H_2O_2$. Detailed descriptions are given of analytical conditions for detn. of each of these metals by differential pulse stripping voltammetry. Pb, Cd and Cu may be determined using an Hg film electrode; Cu and Hg may be determined using an Au electrode; and Ni and Co may be determined using a hanging Hg drop electrode sensitized with the chelating agent dimethyl glyoxime. Data are presented for Cd, Pb, Cu and Ni concn. determined by this method in 12 German, French and Italian wines of the 1970-1977 vintage s. AJDW

## 29

**Shelf life of canned vegetables.**
Hall, M. N.
***Technical Memorandum, Campden Food Preservation Research Association*** No. 208, 87pp. (1978) [3 ref. En]

Canned fruits and vegetables stored for up to 42 months (since 1974) were analysed at 3 months' intervals for Pb, Sn, Fe and Cr levels. Samples containing added $NO_3^-$ (20 and 100 mg/kg) were included after 1 yr (since 1975). Sensory analysis was carried out on the samples without added $NO_3^-$. Tables are presented showing all analytical results to date. The results from the samples tested so far indicate that although metal content in some packs could be a limiting factor in shelf life, packs did not become substandard during storage according to the Campden Standards of Quality test, QC6. A mathematical expression was developed which describes the relationships between $NO_3^-$, time and Sn concn. This was used to predict the effect of various levels of added $NO_3^-$ on the rate of Sn pickup in a number of products. Graphs are included to illustrate this. The study showed that the rate of $NO_3^-$ induced Sn corrosion differs markedly in products with similar pH values, showing that $NO_3^-$ induced detinning is not entirely pH dependent. AS

## 30

**Arsenic and lead in an orchard environment.**
Aten, C. F.; Bourke, J. B.; Martini, J. H.; Walton, J. C.
***Bulletin of Environmental Contamination and Toxicology*** 24 (1) 108-115 (1980) [17 ref. En] [Dep. of Chem., Hobart & William Smith Coll., Geneva, New York 14456, USA]

Samples of soil, apples, grass and vegetables (radishes, carrots, onions, potatoes, tomatoes, green snap beans, cabbage, and Brussels sprouts) were taken from an apple orchard, which was started in 1929 and had been sprayed heavily with lead arsenate, and were analysed for total arsenic and Pb. Results for arsenic and Pb contents are tabulated. Results for arsenic (range and average, p.p.m.) and Pb (range and average, p.p.m.) resp. were: apple pomace, 0.015-0.080, 0.043, 1.08-9.28, 2.52; apple juice, -, <0.05, 0.037-0.085, 0.063. Concn. of arsenic and Pb (p.p.m., dry wt.) resp. in vegetable plants were: Brussels sprouts, 0.11, 1.8; cabbage leaf (inner), 0.38, 2.6; bean pod, 0.17, 2.2; tomato, 0.03, 1.4; potato, 0.02, 0.6; onion, 0.07, 0.9; carrot, 0.11, 7.5; and radish, 0.74, 15.0. In the apple juice arsenic was below the detection limit. Concn. and availability of Pb and arsenic was much smaller at depths where absorption of elements by apple roots takes place, than near the surface where the vegetable plots do not correlate well with total element concn. in the soil. Availability to plants of old As and Pb residues in loam soil is low enough that there is no particular health hazard in apples, tomatoes, beans, cabbage, Brussels sprouts, onions, and potatoes. VJG

## 31

**Heavy metal contents in coastal water fishes of West Malaysia.**
Babji, A. S.; Embong, M. S.; Woon, W. W.
***Bulletin of Environmental Contamination and Toxicology*** 23 (6) 830-836 (1979) [23 ref. En] [Dep. of Food Sci. & Tech., c/o Mussehl Hall, East Campus, Univ. of Nebraska, Lincoln, Nebraska 68583, USA]

Contents of Zn, Pb, Cd and Hg were studied in 6 spp. of fish *(Epinephelus chlostigma, Plotosus anguillaris, Sciaena russeli, Sillago sihama, Tachysurus maculatus,* and *Upeneus sulphureus)* caught around the coastal waters of W. Malaysia. Tabulated data show the concn. of the heavy metals found in the 6 spp. of fish caught at 6 locations. The overall means (p.p.m.) were: Cd, 0.03–0.05; Pb, 0.21–0.32; Zn, 2.3–6.5; and Hg, 0.08–0.10. The Zn and Hg contents for *Tachysurus maculatus* were highest (6.5 p.p.m. and 0.01 p.p.m. resp.), possibly due to their habit of searching for food in muddy silt beds. The levels of all 4 metals were found to be below the max. permissible limits set by the United States Food and Drug Administration. The results show that for all the 6 spp. of fish studied, none have accumulated levels dangerous enough to pose a health problem. VJG

## 32

**Stable lead, $^{210}$Pb and $^{210}$Po in the liver and kidneys of cattle. II. Animals from an area near an abandoned lead mine.**
Bunzl, K.; Kracke, W.; Kreuzer, W.
***Food and Cosmetics Toxicology*** 18 (2) 133–137 (1980) [11 ref. En] [Gesellschaft für Strahlen- & Umweltforschung mbH, München, Inst. für Strahlenschutz - 8042 Neuherberg, Federal Republic of Germany]

Concn. of $^{210}$Pb, $^{210}$Po and stable Pb in the livers and kidneys of 35 cows from an area near an abandoned Pb mine were determined. The data were compared with corresponding data from a control group of cattle from an area which seemed to be unaffected by anthropogenic sources of these metals. Animals from the Pb-mining area differ from the control group in their much higher concn. of stable Pb in both livers and kidneys and in their smaller $^{210}$Pb concn. in these organs. For $^{210}$Po and stable Pb in both kidneys and livers, no correlation was observed for animals from the area near the Pb mine, in contrast to the control group, where a weak correlation was established. [See Health Physics (1979) 37 323 for part I.] VJG

## 33

**[Rapid enrichment method and its use in the determination of metal traces from aqueous solutions by X-ray fluorescence.]** Schnelles Anreicherungsverfahren für den Einsatz der Röntgen-Fluoreszenz-Analyse (RFA) zur Erfassung von Metallspuren aus wässrigen Lösungen.
Scheubeck, E.; Jörrens, C.; Hoffmann, H.
***Zeitschrift für Analytische Chemie*** 303 (4) 257–264 (1980) [17 ref. De, en] [Siemens AG, Postfach 211080, D-7500 Karlsruhe 21, Federal Republic of Germany]

A rapid enrichment method is described, which allows simultaneous precipitation of several metals from aqueous solutions by diethylammonium diethyldithiocarbamate. Under special conditions the precipitate forms a thin layer on a membrane filter, which can be used for X-ray fluorescence detn. of metal traces. It was applied to drinking water, waste water and BIOKLAV decomposition solutions from beef and pork meat, liver and kidneys. 5–100 µg of Cr, Ni, Fe, Cu, Zn, Cd, Pb, Ag, Hg and Se were precipitated from 10–500 ml of water; 1–5 µg of Hg, As, Pb and Cd were precipitated from BIOKLAV decomposition solutions. Recoveries were ≥80%. Time required for one enrichment and filtration of the precipitate is 15 min for a 100 ml sample. No special equipment is needed. [From En summ.] RM

## 34

**Lead-210 content of food samples in India.**
Lalit, B. Y.; Ramachandran, T. V.; Rajan, S.
***Radiation and Environmental Biophysics*** 18 (1) 13–17 (1980) [15 ref. En] [Air Monitoring Sect., Bhabha Atomic Res. Cent., Bombay-400 085, India]

The $^{210}$Pb content was measured in samples of cereals (rice and wheat) and in pulses (*Cajanus cajan*) collected on a quarterly basis between 1970 and 1976, and in samples of composite meals (Thali) collected between 1971 and 1978 from 2 canteens (1 in the city and the other at the Research Centre). Details of sampling and analytical chemistry procedures are given. Results are tabulated. These show that most of the food samples have $^{210}$ Pb contents in the range of 1–5 pCi/kg sample. 3 rice and 2 wheat samples had levels in the range 2–5 pCi/kg. The concn. in composite meals were mostly in the range of 1–3.5 pCi of $^{210}$ Pb per composite meal. Average $^{210}$ Pb concn. for the samples (pCi/kg) was: rice, 3.6; wheat, 3.6; and pulses, 3.1. Composite meals had an average $^{210}$ Pb concn. of 1.7 pCi/meal. VJG

## 35

**[Environmental pollution by and toxicological evaluation of heavy metal (mercury, lead, cadmium) residues.]** Zu einigen Fragen der Umweltbelastung und rückstandtoxikologischen Beurteilung wichtiger Schwermetalle (Quecksilber, Blei, Kadmium).
Kühnert, M.
***Archiv für Experimentelle Veterinärmedizin*** 34 (3) 339–345 (1980) [15 ref. De, en, ru] [Sektion Tierproduktion & Veterinärmed., Karl-Marx-Univ., Leipzig, German Democratic Republic]

Natural occurrence of Pb, Hg and Cd and their compounds in the environment, and the significance of contamination of foods and feeds with these metals, are discussed, together with the importance of taking natural background levels of heavy metals into account in establishing tolerances for foods. Proposed WHO tolerances for foods of animal origin are 0.1 p.p.m. for Hg and Cd, and 0.5 p.p.m. for Pb. These tolerances do not, however, take account of the possibility of all 3 heavy metals occurring in a single sample. IN

## 36

**[Heavy metals and other toxic trace elements in the human food chain. A contribution to environmental research.]** Schwermetalle und andere toxische Spurenelemente in der Nahrungskette des Menschen. Ein Diskussionsbeitrag zur Umweltforschung.
Claussen, T.
***Berichte über Landwirtschaft*** 57 (1) 105–117 (1979) [30 ref. De, en, fr] [Umweltbundesamt, Bismarckplatz 1, 1000 Berlin 33]

In calculation of limits for toxic trace elements in gaseous emissions, danger to humans is often estimated only on the basis of uptake by inhalation. Significance of contamination of soils and uptake by food plants, and direct contamination of plants by dusts, etc., is discussed with reference to a number of elements and dose/accumulation relationships. Interactions of several toxic elements are also considered. Present and future significance of toxic trace elements is discussed. DIH

## 37

**[Contamination of canned foods with metals.]**
Biffoli, R.; Chiti, F.; Mocchi, M.; Pinzauti, S.
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** 9 (4) 241–246 (1980) [18 ref. It, en] [Istituto di Chimica Farmaceutica, Univ. di Firenze, Florence, Italy]

A total of 98 samples of canned foods (including tomato, meat, tuna, vegetable and fruit products), collected from retail sources over the period Jan. 1978–July 1979, was analysed for Fe, Sn and Pb by AAS. A table of results is given. 27 of the 98 cans were in poor condition. Overall ranges of values were (p.p.m.): Pb traces–10.1; Sn 8.5–34.6; and Fe 2.8–1710. 37 samples had Pb concn. <1 p.p.m., 30 had Pb concn. of 1–2 p.p.m., 9 had Pb concn. of 2–3 p.p.m., and 22 had Pb concn. >3 p.p.m. Similarly, 13 samples had Sn concn. <50 p.p.m., 35 had Sn concn. of 50–100 p.p.m., 30 had Sn concn. of 100–200 p.p.m., and 20 had Pb concn. >200 p.p.m.; and 74 samples had Fe concn. <50 p.p.m., 6 had Fe concn. of 50–100 p.p.m., 8 had Fe concn. of 100–200 p.p.m. and 10 had Fe concn. >200 p.p.m. Data are also given for 2 cans of anchovies in sauce purchased in May 1974 and analysed with the other samples; at the time of examination, the cans were in poor condition. Concn. of metals in the can contents were (p.p.m.): Pb 14 and 45; Sn 740 and 1840; and Fe 1048 and 5800. The potential health hazard from canned foods with high Pb contents is discussed, with reference to the desirability of legislation enforcing labelling of cans with the date of manufacture and/or the last recommended date for use. AJDW

## 38

**Determination of cadmium and lead in some Egyptian fish.**
Khattab, F.; Haroun, I.
***Egyptian Journal of Pharmaceutical Sciences*** 18 (4) 455–463 (1977) [12 ref. En, ar] [Analytical Chem. Dep., Cairo Univ., Cairo, Egypt]

The following fish (i) *Tilapia nilotica* (bolti), (ii) *Clarias anguillaris* (kharmout), (iii) *Barbus anema* (benni), (iv) *Mochocus niloticus* (korkar, shal), (v) *Alestes nurse* (sardina) and (vi) *Tetraodon fabaka* (fahaka) from the River Nile were examined for Cd and Pb contamination by AAS and by the standard dithizone spectrophotometric method, to examine levels of these minerals in relation to safety. Results for (i)–(vi), resp., are: for Cd 500, 800, 88, 190, 130 and 310 parts/billion by the standard method and 520, 780, 102, 200, 135 and 295 by AAS; and for Pb 280, 1000, 80, 350, 100 and 750 by the standard method and 250, 1160, 100, 330, 90 and 725 by AAS. These high values can be attributed to the presence of factories by the river. Fish living in bottom sediments, i.e. (ii) and (vi), contained higher levels than the rest; both are predators. This indicates that certain industrial waste requires more careful monitoring and possibly restriction. LH

## 39

**[Multiple determination of Pb and Cd in fish by electrothermal AAS after wet ashing in commercially available Teflon beakers.]** Vielfach-Bestimmung von Pb und Cd in Fischen durch elektrothermale AAS nach Naßveraschung in kommerziellen Teflon-Bechern.
Kruse, R.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 171 (4) 261–264 (1980) [10 ref. De, en] [Staatliches Vet. für Fische & Fischwaren Cuxhaven, Schleusenstraße, D-2190 Cuxhaven, Federal Republic of Germany]

A method for acid digestion of food samples for AAS analysis that avoids many contamination problems is described, with particular reference to fish samples. 100–250 mg homogenized sample are placed in 10 ml polytetrafluoroethylene (PTFE) beakers, the wet digestion mixture ($HNO_3/HClO_4$, 2 + 1) is added, and the beaker is covered with a PTFE lid without compression. Beakers are heated in an Al block at 130°C for 6 h, then at 250°C for a further 6 h. This allows complete evaporation to dryness. Residue is then easily soluble in $HNO_3$. Graphically presented results of electrothermal AAS measurement show that matrix effects on Cd signal are minized by optimization of the atomization temp. for the matrix. Similar results were not obtained with Pb. Lowest detection limit of the assay (based on 3 × s.d. of blank assay) corresponds to sample content of 2 ng Pb/g and 0.2 ng Cd/g. Mean contents of Pb and Cd in Baltic herring muscle (5 detn.) were 0.27 µg/g and 1.25 ng/g, resp., with corresponding s.d. of 0.014 and 0.143 and variation coeff. of 5.2% and 11.4%. DIH

## 40

**[Determination of heavy metal contents in canned tomato concentrates.]**
Koncz, I.; Kovacsne Molnar, K.
***Konzerv- es Paprikaipar*** No. 4, 148–151 (1979) [Hu. de, ru] [Konzerv-es Paprikaipari Kutationtezet, Budapest, Hungary]

The relationship between various protective inside lacquers of cans, and the metal contents of canned tomato concentrates was studied; significant differences were found between the one- and two-layered lacquering processes. Highest Sn content was detected when one-layered golden lacquer (Wiederhold 48 335, epoxy-phenol, 6.1 g/m$^2$) was used. Best results were obtained with two-layered pigmented-golden lacquer combination (Stoll-lack 1300 B, epoxy, $TiO_2$, 13.5 g/m$^2$). When the Sn contents were determined in the same batch of canned tomato, differences in the Sn content of the concentrates were invariably due to damaged cans. The adhesion of the one-layered red pigmented lacquer (BAST 50-3804, epoxyy, $Fe_2O_3$, 15.5 g/m$^2$) was unsatisfactory because it could be easily detached in damaged cans. No significant differences in Pb content of canned tomato concentrate could be detected between the various lacquers (approved value 3 mg/kg). The permitted Sn content is 250 mg/kg. ESK

## 41

**Determination of lead in drinking water by atomic-absorption spectrophotometry with electrothermal atomisation.**

Bertenshaw, M. P.; Gelsthorpe, D.; Wheatstone, K. C.
***Analyst*** 106 (1258) 23-31 (1981) [15 ref. En]
[Nottingham Reg. Lab., Severn-Trent Water Authority, Meadow Lane, Nottingham, NG2 3HN, UK]

The use of electrothermal atomization to determine concn. of Pb in water, although sensitive, generally suffers from suppressive interference effects that can produce large and variable negative bias. This paper describes a procedure that employs a lanthanum pre-treatment technique, which when tested with a range of 14 drinking water samples was shown to overcome such interference. The pre-treatment technique can be either impregnation of the furnace tube with La or the addition of La (as $LaCl_3$) to each sample. The procedure has a limit of detection of $<1.0$ μg/l, a total s.d. of $<1.5$ μg/l, or 5% of the concn., and a bias of $<5$ μg/l or 10% of the concn. over a working range of 0-100 μg/l for both manual and automated injection of samples. AS

## 42

**Determination of lead, copper, and cadmium in wine and beer by potentiometric stripping analysis.**

Jagner, D.; Westerlund, S.
***Analytica Chimica Acta*** 117, 159-164 (1980) [5 ref. En]
[Dep. of Analytical & Marine Chem., Chalmers Univ. of Tech., S-412 96 Göteborg, Sweden]

Instrumentation and analytical procedures for direct detn. of Pb, Cu and Cd in alcoholic beverages in the concn. range 1-100 μg/l are outlined. The accuracy of the potentiometric stripping method was tested by comparison with AAS; the discrepancy was never $>15\%$. In repeated analyses for Pb and Cu from the same bottle of wine the relative s.d. was 4% for Pb and 6% for Cu in deoxygenated samples. Precision was much poorer (20% for both elements) in non-deoxygenated samples. The relative precision in the Cd detn. was only 30%, due to its low concn. It is concluded that the technique has considerable advantages when compared to other electroanalytical techniques. JRR

## 43

**Some analytical aspects of lead and cadmium determination in drinking water by atomic absorption spectrophotometry.**

Pande, S. P.; Pendharkar, A. V.
***Journal of the Institution of Chemists (India)*** 52 (4) 141-144 (1980) [7 ref. En] [Nat. Environmental Eng. Res. Inst., Nagpur-440 020, India]

Possible interference by various foreign ions in the detn. of Pb and Cd by AAS was studied, especially interference due to $Ca^{2+}$ and $Mg^{2+}$. Ca was found to interfere significantly in Cd estimation; this effect could be eliminated by addition of Al ions. CFTRI

## 44

**[Influence of the type of container on the concentration of metals in citrus essential oils.]**
[Lecture]

Bruno, E.; Chiricosta, S.; Licandro, G.
***Essenze Derivati Agrumari*** 48 (3) 265-281 (1978)
[6 ref. It] [Istituto di Merceologia dell'Univ., Messina, Italy]

Migration of Fe, Cu, Pb, Zn, Sn, Al and Mn into citrus essential oils from different types of commonly used containers (lacquered cask, stainless steel, Al, tinplate, copper coated tinplate, colourless and dark glass) was investigated by AAS during 5 months' storage and transport at ambient temp. Results, shown graphically and in tables, revealed considerable metal migration from tinplated containers, especially a steady rise of Sn (increase from 0.047 to 1.107 and 2.060 p.p.m. resp. in tinplate and copper coated tinplate which did not reach a max.); other metals reached a max. within 2 months. In Al containers a rise in Al content from 0.047 to 0.072 p.p.m., in lacquered containers rises of Zn and Pb (from 0.160 to 0.187 and from 0.54 to 0.61 p.p.m.) were observed within 2 months. [See FSTA (1981) 13 6J839.] RM

## 45

**Effect of car exhausts on lead contamination in vegetables grown adjacent to Kuala Lumpur - Ceras Highway.**

Low, K. S.; Lee, C. K.
***Pertanika*** 2 (2) 149-151 (1979) [6 ref. En, my] [Fac. of Sci. & Environmental Studies, Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia]

The level of Pb was determined in leafy vegetables and in soil of 2 areas, one a field near a heavily used road, and the other a garden near a little-used road, where Pb deposition was due almost solely to car exhaust fumes. Vegetables selected were: (i) kangkong (*Ipomoea reptans*), (ii) bayam (*Amaranthus gangeticus*), (iii) choy sam (*Brassica rapa*), (iv) spring onion (*Allium ascolonium*), (v) lettuce (*Lactuca sativa*), (vi) kai choi (*B. junus*), and (vii) long bean (*Vigna sinensis*) from the field and (i)-(iii) from the garden. Soil was also sampled (0-10 cm) at each vegetable sampling site if possible. Pb concn. in unwashed vegetables from the farm was 0.25-0.84 p.p.m. and from the garden 0.27-0.47 p.p.m., with (i) having the greatest absorption potential. Washing (i)-(iii) from the field and garden, removed 35-54% and 9-26% of surface Pb resp. Food regulations allow a max. of 2 p.p.m. Pb in all foods, and vegetables grown ≥50 m away from the heavy traffic road were below this level. LH

## 46

**[Heavy metals in cereals. I. Contamination of grain produced in Italy.]**

Baldini, M.; Grossi, M.; Micco, C.; Stacchini, A.
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** 9 (5) 299-310 (1980) [4 ref. It, en]
[Istituto Superiore di Sanita, Rome, Italy]

Levels of Pb, Cr, Cu, Cd and Zn were determined by AAS in numerous samples of wheat grown in various regions of Italy in 1978. Tables and block diagrams of results are given. The max. recorded concn. of these heavy metals were (p.p.m.): Pb 1.55; Cr 1.55; Cd 3.03; Zn 47.41; and Cu 33.98. Regional variations in heavy metal concn. in wheat are presented. diagramatically, and discussed. AJDW

## 47

**[Studies on the accumulation of trace elements in fish. IV. Distribution of heavy metals and arsenic in yellowtail tissue.]**
Yasuda, K.; Katsuki, Y.; Ueda, K.; Naoi, Y.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** 29 (1) 177–181 (1978) [11 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Muscle, liver, kidney, pyloric caecum, digestive organs, spleen, heart, ovary and gills of eight 82–91 cm long Yellowtails were analysed for heavy metals i.e. Pb, Cd, Zn, Cu, Mn, Co, Cr, total and methyl Hg, and arsenic, by AAS and GLC. Total and methyl Hg levels were highest in muscle, caudal muscle having 30% more than white muscle; 4 fish had levels above Japanese recommended levels i.e. $>0.4$ and $>0.3$ p.p.m. resp. for total and methyl Hg. Cd was found at up to 1.1 p.p.m. in liver, but at $<0.1$ p.p.m. generally elsewhere. Levels of other heavy metals and arsenic examined were considered as background, and presumably safe. [From En summ.] [See FSTA (1980) 12 4R221 for part III.] LH

## 48

**[Studies on the accumulation of trace elements in fish. V. Trace elements in crustacea.]**
Shimamura, Y.; Tamura, Y.; Maki, T.; Nishigaki, S.; Naoi, Y.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** 29 (1) 182–189 [17 ref. Ja] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Concn. of Se, Hg, arsenic, Cd, Pb, Cu, Zn, Co, Cr and Mn in 8 spp. of shrimp and 6 spp. of crab from various areas of Japan are tabulated. Hg concn. in both muscle and internal organs was generally low, $<0.1$ mg/kg. There was a wide variation between spp. in Se concn. of muscle, but within spp. values were fairly constant. Regional differences were observed particularly in the Hg content of snow crab, the Hg and arsenic content of kegani and Hg, Cd and arsenic contents of tiger prawn. No relationship was found between trace metal concn. and body wt. for any spp. studied. Apart from Hg, metals were found in higher concn. in internal organs than in muscle. Cd concn. in crabs tended to be higher in body than leg meat. [See preceding abstr. for part IV.] BWH

## 49

**Trace metal and organochlorine pesticide residues in New Zealand farmed oysters: a preliminary survey.**
Winchester, R. V.; Keating, D. L.
***New Zealand Journal of Science*** 23 (2) 161–169 (1980) [32 ref. En] [Chem. Div., Dep. of Sci. & Ind. Res., Private Bag, Petone, New Zealand]

Oysters were collected from 8 sites in northern New Zealand and analysed for Fe, Cu, Mn, Pb, Cd, Cr, Zn, Se, Hg, As, Sb, and organochlorine pesticides including lindane, DDE and DDT, by AAS. A table of results is given for trace metal concn. in 17 samples of (i) farmed oysters (7 sites) and 5 samples of (ii) wild oysters (from 1 site). Mean Zn concn. exceeded the New Zealand Food & Drug Regulation limit of 40 µg/g by a wide margin (202 and 290 µg/g wet wt. for (i) and (ii) resp.); Cu and Cr levels were normal (mean concn. 20 and 31 µg/g and 0.23 and 0.45 µg/g, resp.); Cd occasionally exceeded the permitted level of 1 µg/g (highest concn. 20 and 46 µg/g in (i) and (ii) resp.) and requires further study; arsenic levels exceeded New Zealand regulations (mean concn. 1.95 and 1.45 µg/g), perhaps because of uptake from leached wood preservative from oyster racks, but they comply with As levels set by some other countries; Fe, Mn, Hg, Pb, Se and Sb levels complied with those of the rest of the world (mean concn. 59 and 34, 4.3 and 1.5, 0.04 and 0.02, 0.61 and 0.70, 0.15 and 0.25, and unstated). Pesticide residues were not a significant problem, being in non-detectable or trace amounts. LH

## 50

**A study of canned fish behaviour during storage.** (In '*Advances in fish science and technology*' [see FSTA (1981) 13 6R300].) [Lecture]
Durand, H.; Thibaud, Y.
pp. 237–240 (1980) [En] [Inst. Sci. et Tech. des Peches Maritimes, Nantes Cedex, France]

5 canned fish products traditionally consumed in France were used in the studies: sardines in oil, sardines in oil with lemon, sardines in tomato sauce, mackerel in tomato sauce, mackerel pickled in white wine. After deheading, evisceration and cooking in steam at 103°C, the fish (with the relevant sauce) were packaged either in Al cans (made of an Al-Mg alloy and with the inside varnish covered with a layer of polypropylene) or in tinplate cans (non-stick type with one lid soldered). The cans were stored at 20°C or 37°C for up to 2 yr, the tinplate cans being stored with the soldered lid turned downwards. Studies were made after 6 months, 1 yr and 2 yr of the organoleptic quality (colour, flavour, odour, texture) of the products, of the inside and outside appearance of the cans (e.g. degree of corrosion and detinning), and of the pH of the homogenized contents or the oil acidity of sardines in oil or in oil with lemon (expressed in mg oleic acid/100 g oil). After 2 yr, the homogenized contents were also analysed for Pb, trimethylamine and trimethylamine oxide. Results, which are detailed in graphs and tables, included the following: the flavour of fish and tomato sauce was better preserved in tin cans than in Al cans; metallic flavours, due to de-tinning, appeared largely in tin cans; Al cans remained apparently intact, both inside and outside; Pb contents were low in Al cans, the higher quantities in tin cans presumably originating from the weld; no trimethylamine oxide was detected in any can after 2 yr. JA

## 51

**[Influence of salting on the heavy metal content of meat products.]** Einfluss des Salzens auf den Schwermetallgehalt von Fleischwaren.
Hecht, H.

***Fleischwirtschaft*** 60 (10) 1806, 1808–1810, 1812–1814; 1887 (1980) [11 ref. De, en]

The Hg, Cd and Pb contents were investigated in 108 commercial samples of salts from various sources: from Bavarian deposits, sea salts, N. German salts, etc. Results, tabulated by origin, showed that the salt from Bavarian deposits contained much higher concn. of heavy metals than the other types, with mean values and ranges (parts/billion) of Hg 0.97, <0.03–8.49 (vs. 0.34, <0.03–1.5 and 0.63, <0.03–1.72 for marine and N. German salt, resp.); Cd 22.8, 2.87–71.3 (vs. 17.6, 2.9–31.8 and 3.22, <0.25 and 22.0); Pb 878, 25–3850 (vs. 83.8, 5.0–438 and <5.0, <5.0–<25.0). Means for all salt samples were 0.97, 14.4 and 473 for Hg, Cd and Pb resp. The importance of low metal contamination in the salt for ensuring low contents in meat products is emphasized; controlling manufacture and purification methods for salt from contaminated deposits is recommended. RM

## 52

**[Social Administration Ordinance on evaluation of drinking water on the basis of Pb content.]**
**Sweden,** Statens Livsmedelsverk
***Statens Livsmedelsverks Författningssamling*** **SLV FS 1980:16,** 2pp. (1980) [Sv] [Box 622, 751 26 Uppsala, Sweden]

This Ordinance gives instructions for sampling of drinking water supplies for evaluation of Pb, and specifies methods for detn. of the Pb concn. Water samples with Pb conc. >0.05 mg/l are to be considered unsuitable for human consumption; water supplies with concn. of 0.01–0.05 mg/l are considered questionably safe for human consumption, and the source of Pb contamination should be identified. AJDW

## 53

**Comparative toxicity to rats of lead acetate from food or water.**
Mahaffey, K. R.; Rader, J. I.; Schaefer, J. M.; Kramer, S. N.
***Bulletin of Environmental Contamination and Toxicology*** **25** (4) 541–546 (1980) [17 ref. En] [Food Res. Lab., FDA, 1090 Tusculum Avenue, Cincinnati, Ohio 45226, USA]

In view of the widespread contamination of food and water supplies with Pb, investigations were carried out to determine if equal concn. of lead acetate added to food or to water were equally bioavailable to rats. No marked differences were found in the bioavailability of the Pb. VJG

## 54

**[Variations of Pb, Cu, Zn, Mn and Fe contents in products canned in tinplate as a function of time.]**
Branca, P.
***Bollettino dei Chimici dei Laboratori Provinciali*** **6** (S3) 307–317 (1980) [7 ref. It] [Lab. Chimico Provinciale di Torino, Via S. Domenico 22B, 10122 Turin, Italy]

The metal contamination of canned productions during long storage was investigated. Cu, Fe, Zn, Mn and Pb contents and pH were determined in cases of a mixed vegetable salad in wine vinegar, sterilized and not sterilized, after 90, 180, 270 and 315 days storage. Results, shown graphically and in tables, suggested that metal migration in sterilized products was insignificant; in non-sterilized products, Cu and Mn contents remained practically constant; and Fe, Zn and Pb contents increased during storage, to render the product unfit for consumption after 270 days. [See also FSTA (1980) 12 6C290.] RM

## 55

**Evaluating home plumbing corrosion problems.**
Hoyt, B. P.; Kirmeyer, G. J.; Courchene, J. E.
***Journal American Water Works Association*** **71** (12) 720–725 (1979) [9 ref. En] [Seattle Water Dep., Seattle, Washington, USA]

Plumbing corrosion by Seattle water supplies was studied. Problems caused are: aesthetic, viz. rusty water, red or blue staining, and metallic tastes; economic; and health. Means of documenting incidences and severity of such corrosion are considered. Amount of metal leached from pipes was examined in relation to water quality characteristics. Pb, Cd, Cu, Zn, Fe and Mn were commonly found in tap waters of an aggressive nature. Seattle water from Told and Cedar rivers had, resp.: dissolved $O_2$ content >95% saturation for both; alkalinity, 2.5 and 16 mg/l (as $CaCO_3$); pH, 6.0 and 7.1; hardness, 8 and 21 mg/l (as $CaCO_3$); silica, 4 and 8 mg/l (as $SiO_2$); specific conductance, 26 and 52 uS/cm. LH

## 56

**[Atomic absorption spectrophotometry of metals in sugars using solvent extraction with sodium diethyldithiocarbamate/methyl isobutyl ketone.]**
Saito, S.
***Proceedings of the Research Society of Japan Sugar Refineries Technologists [Seito Gijutsu Kenkyukai-shi]*** **27,** 19–23 (1977) [10 ref. Ja, en]

Detn. of heavy metals by AAS is generally performed after pre-treatment of the samples by either dry ashing or wet combustion; such pre-treatment has various disadvantages, i.e. it is time-consuming, and subject to interference by impurities in the samples and reagents. This study explored the possibility of omitting pre-treatment in the detn. of Cu, Pb, Cd and Cr in sugars by AAS, and instead using solvent extraction, sodium diethyldithiocarbamate being utilized as a chelating agent. The procedure involved adding 10 ml acetic acid-ammonium acetate buffer, 2 ml of 25% rochelle salt solution, 5 ml of 1% sodium diethyldithiocarbamate and 10 ml methyl isobutyl ketone to 40 ml of a 10–20% (w/v) sugar solution, followed by shaking for 4 min, allowing the mixture to stand until the layer of methyl isobutyl ketone has separated and then analysing this separated layer by AAS. The method was successfully applied to detn. of the 4 heavy metals in sugars. [From En summ.] JA

## 57

**[Effect of location and age on the lead and cadmium contents of cattle kidneys.]** Über den Blei- und Cadmium-Gehalt in Rindernieren in Abhängigkeit von zwei verschiedenen Standorten sowie vom Lebensalter.
Agthe, O.; Dickel, H.

*Archiv für Lebensmittelhygiene* 31 (5) 169–172 (1980) [10 ref. De, en] [Staatliches Veterinäruntersuchungsamt Oldenburg, Philosophenweg 38, 2900 Oldenburg, Federal Republic of Germany]

219 samples of kidney from cattle aged <1 to 8 yr, from 2 emergency-abattoirs in (i) a non-industrial and (ii) an industrial area, were examined for Pb and Cd contents. Results showed mean Pb contents of 0.06 and 0.25 p.p.m., resp. in samples from areas (i) and (ii) ($P < 0.001$), and no significant effect of age. Cd contents did not differ significantly with the location but were linearly related to the age of the animals. ($P < 0.001$). The tolerance level for Pb (0.8 p.p.m.) was exceeded in 3 samples from (ii); Cd tolerance (1.0 p.p.m.) was exceeded in 20% of samples from (i), 46% of samples from (ii) and in all animals >4 yr of age. RM

## 58

**Mercury and lead concentrations in some species of fish from the Tuscan coasts (Italy).**
Buggiani, S. S.; Vannucchi, S.
***Bulletin of Environmental Contamination and Toxicology*** 25 (1) 90–92 (1980) [8 ref. En] [Inst. of General Path. & Pathologic Anatomy, Vet. Med., Univ. of Pisa, via delle Piagge, 2, Pisa, Italy]

Pb and Hg concn. in muscle, liver and kidney of marine fishes caught near the Tuscan coasts of Italy during spring and summer 1977 were determined. Spp. sampled were those marketed as 'frittura mista' (mixed fried fish) namely, Mugilidae, Cupleidae, Mullidae, Sparidae, Scomberidae, Triglidae, Pleuronectidae, Anguillidae and Gobiidae. Composite samples obtained by mixing homogeneous specimen samples taken from individual fish were analysed. The samples were wet digested by the method of Pearce [see FSTA (1976) 8 11R676]. The acid digests were analysed by flameless atomic absorption. Data show that both Hg and Pb were consistently present in composite samples corresponding to the various fishing locations. Max. absolute values are reached by both metals in the same samples. Ranges were for Hg and Pb resp. (μg/g): muscle, 0.01–0.70, 0.10–0.52; liver 0.01–1.21, 0.10–0.41; kidney, 0.01–5.43, 0.10–0.42. VJG

## 59

**[Harmful metal contamination in foods of animal origin.]** Grundbelastung von Lebensmitteln tierischer Herkunft mit Schadmetallen.
Holm, J.
***Fleischwirtschaft*** 60 (12) 2227–2229 (1980) [16 ref. De, en] [Staatliches Veterinäruntersuchungsamt Braunschweig, Dresdenstraße 6, D-3300 Braunschweig, Federal Republic of Germany]

Pb and Cd contents are presented from detn. in kidney and liver samples of large numbers of farm animals, poultry and game from contaminated and uncontaminated areas, as well as Pb contents in blood samples from approx. 4000 cattle, in relation to sources of pollution and mean Pb contamination in blood, liver and kidneys of cattle in a pure air district and a polluted area. Tabulated data suggest that Pb contents are very dependent on the environment (traffic density, polluted area), while Cd contamination is largely unaffected. Max. Pb levels were 0.92 mg/kg fresh matter in blood, 4.94 in liver and 12.1 in kidney; the max. ratio of metal contamination in organs of animals from unpolluted vs. polluted areas were 1:4–1:10 for Pb. The ratio of Pb in blood:Pb in liver was about 1:10 in 5 herds, suggesting that early recognition of Pb contamination in live animals could be used to monitor polluted areas (subject to further research). RM

## 60

**Specification for sodium carboxymethyl cellulose, food grade (1st revision).**
**India,** Indian Standards Institution
***Indian Standard*** **IS 5306,** 13pp. (1978) [En]

This standard prescribes general requirements and methods of sampling and testing sodium carboxymethyl cellulose for use as food additive, and also covers chemical name and formula, packaging and storage. Specific requirements include: purity, >99% by mass; degree of substitution, <0.20–1.00; loss on drying, <10%; NaCl on dry basis, <0.9% by mass; free gylcolate, <0.1% by mass; pH of 1% colloidal solution, 6–8.5; viscosity of 2% solution in presence of a preservative, >25 for fresh or 4-wk old solution; Pb, <10 mg/kg; arsenic <3 mg/kg; and heavy metals, <40 mg/kg. 6 appendices detail reagents, procedures and calculations applicable for determining degree of substitution, loss on drying, NaCl, free glycolate, viscosity and heavy metals. A list of 37 Indian standards on food additives is appended. KME

## 61

**The contribution of lead in water to dietary lead intakes.**
Smart, G. A.; Warrington, M.; Evans, W. H.
***Journal of the Science of Food and Agriculture*** 32 (2) 129–133 (1981) [8 ref. En] [Food Sci., Div., Min. of Agric., Fisheries & Food, Great Westminster House, Horseferry Road, London SW1P 2AE, UK]

Preliminary experiments were carried out to determine the uptake of Pb from both hard and soft waters used in the preparation of food and beverages. Pb concn. in water for the range 0.05–0.5 mg/l were used to prepare composite groups representing root vegetables, other vegetables and beverages whose composition reflected per capita consumption of these foods in the UK. The uptake of Pb from water was highest for the composite group of other vegetables which comprises 70% by wt. of green vegetables. For each of the composite groups and the particular water samples used there was little relative difference in uptake whether foods were prepared in hard or soft water. Calculation of the contribution made by lead in water used for preparation of foods and beverages to the total dietary lead intake indicates that at levels of Pb of 0.02 mg/l, the contribution is about 10% but this can rise to about 40% as Pb levels in the water approach 0.1 mg/l. AS

## 62

**Cadmium and lead content of soybean products.**
Braude, G. L.; Nash, A. M.; Wolf, W. J.; Carr, R. L.; Chaney, R. L.
***Journal of Food Science*** 45 (5) 1187–1189, 1199 (1980) [21 ref. En] [FDA, 200 C Street S.W. Washington, DC 20204, USA]

Soybeans grown on sludge-amended soil high in Cd content were analysed for Cd and Pb, then fractionated to simulate industrial food processing. Of these fractions, oil retained the least Cd, which accumulated in the protein-enriched fractions. Protein products prepared in the laboratory by simulated industrial processes showed no practical differences in Cd levels. Commercial soybean products for human consumption [defatted flour, concentrates, isolates] obtained from manufacturers and markets showed no elevated Cd levels. Pb levels were high in isolated instances, presumably from contamination during processing. Cd in high-Cd soybeans is retained by protein products consumed by humans; increased Cd application to soils may be hazardous to humans. However, soybean products presently being marketed do not contain excessive Cd or Pb. IFT

## 63

**[Transfer of lead and cadmium from milk to cheese.]**
Hayashi, M.; Ito, O.; Akuzawa, R.; Oishi, H.
***Medicine and Biology, Japan [Igaku to Seibutsugaku]*** 100 (1) 23–25 (1980) [6 ref. Ja] [Dep. of Public Health, Hyogo Coll. of Med., Nishinomiya, Japan]

Pb and Cd were added to pasteurized cows' milk to give concn. of 1, 10 and 50 mg/kg, and the milk was made into cheese. In total 1.9 l milk produced 160–180 g cheese. At the 3 concn., resp., transfer of Pb to cheese was 38, 33 and 21%, and transfer of Cd was 22.6, 31.0 and 33.6%. Actual concn. in cheese was 4.07, 37.56 and 126.20 mg Pb/kg and 2.54, 35.20 and 190.60 mg Cd/kg. It is thought that at low concn. Pb is transfered into cheese with fat whereas Cd binds to whey proteins. At high concn. excess Pb is lost whereas excess Cd is transferred to cheese. BWH

## 64

**[Experience with the use of 'Damrow Chester' installation in Woringen cheese factory.]** Erfahrungen mit dem Einsatz der Damrow-Chester-Anlage im Käsewerk Woringen.
Anon.
***Deutsche Milchwirtschaft*** 31 (44) 1774, 1776 (1980) [De]

Information is given briefly on the use of Damrow plant (3 'double O' cheese vats, a drainage band conveyor system, stirring and salting device, etc.) in the cheese factory Woringen, Federal Republic of Germany, for the manufacture of mainly Chester cheese with 50% fat in DM from up to 200 000 kg milk/day. Experience obtained with the plant over a 6-month period since it was started up in May 1980 is discussed. FL

## 65

**Adsorption of trace metals during filtration of potable water samples with particular reference to the determination of filtrable lead concentration.**
Gardner, M. J.; Hunt, D. T. E.
***Analyst*** 106 (1261) 471–474 (1981) [2 ref. En] [Analytical Div., Water Res. Cent., Medmenham Lab., PO Box 16, Medmenham, Marlow, Buckinghamshire, SL7 2HD, UK]

Substantial adsorptive losses of dissolved Pb may occur during filtration of potable water samples. The polycarbonate apparatus gave smaller losses than the borosilicate-glass apparatus (perhaps due to the high surface area of the latter). The presence of Ca in the filtered solution reduced adsorptive Pb loss from synthetic solutions, possibly by competitive adsorption, but pre-treatment of equipment with a solution containing Ca is not recommended as a routine procedure. Rinsing the filtration system with the sample may reduce adsorptive loss and is preferred as a pre-treatment. It is essential that before routine application of filtration for trace metal detn. appropriate tests are conducted to measure the adsorptive loss likely to occur with the sample types encountered. AI

## 66

**[Lead uptake in canned orange and tomato juice.]**
Bleiaufnahme von Orangensaft und Tomatensaft in Dosen.
Bielig, H. J.; Askar, A.; Treptow, H.
***Flüssiges Obst*** 45 (11) 410–413 (1978) [15 ref. De, en, fr] [Tech. Univ. Berlin, Königin-Luise-Strasse 22, D-1000 Berlin 33]

The effects of can filling, storage time and temp., container material, pH, head space and $NO_3^-$ contents on Pb uptake by orange juice (11.5° Brix, pH 3.5) and tomato juice (4.8°Brix, pH 4.1) were investigated. Diagrams showed that the juices contained about 100 parts/billion (p.p.b.) Pb before filling. After an initial rise during can filling, Pb concn. of orange juice did not change during 25 wk storage in bottles and in unlacquered cans at 4°, 16° or 30°C or in lacquered cans at 4°C, but rose in lacquered cans to about 400 p.p.b. at 16°C, and 700 p.p.b. at 30°C; max. rises in tomato juice in unlacquered cans were to 420 p.p.b. at 30°C, and 300 p.p.b. at 16°C (vs. 260 p.p.b. in lacquered cans at 4°, 16° or 30°C). Headspace, and above all $NO_3^-$ (50 mg/l) increased Pb uptake through its effect on corrosion, (to 2180 p.p.b. in orange juice, after 12 wk at 16°C in unlacquered cans). Under all conditions, orange juice absorbed more Pb than tomato juice. The increased Pb uptake by orange juice in lacquered cans at higher temp. is discussed in detail. A max. of 400 p.p.b. in canned fruit and vegetable juices seems feasible. RM

## 67

**[Collaborative study on determination of lead in canned vegetable juice by polarography.]**
Yamato, K.; Mogi, Y.; Watanabe, H.; Ouchi, I.; Horio, T.; Toyoda, H.; Yoshimoto, S.; Murata, T.; Masuda, S.; Yamamoto, M.; Hirano, K.; Mori, M.; Suzuki, K.; Miyanaga, N.; Ohashi, S.; Dobashi, T.; Kotani, T.; Shimada, T.

***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** 20 (5) 307–316 (1979) [9 ref. Ja, en] [567, Marunouchi Building, Chiyoda-ku, Tokyo, Japan]

A collaborative study was conducted on the polarographic detn. of Pb in canned vegetable juice. The ash obtained by dry-ashing a sample at 450°C was dissolved in 6N HCl and the pH was adjusted to 6.4–6.6 with ammonium citrate buffer solution and ammonia water. This solution was treated on a Dowex A-1 resin column. This procedure completely removed Sn, which interfered with Pb detn. Pb was eluted from the column with dil. $HNO_3$, concentrated, and the residue was dissolved in electrolyte for polarography. The interlaboratory coeff. of variation by this method were 8.0–10.9%. If the treatment for the removal of Sn was omitted, the analytical data showed much greater variation. It thus appears that the removal of Sn from test solutions is essential for reliable detn. of Pb in canned foods by polarography. AS

## 68

**[Collaborative study on determination of lead in canned vegetable juice by atomic absorption spectrophotometry.]**
Yamamoto [Yamato], K.; Mogi, Y.; Watanabe, H.; Ninomiya, E.; Horio, T.; Toyoda, H.; Yoshimoto, S.; Murata, T.; Masuda, S.; Yamamoto, M.; Hirano, K.; Mori, M.; Suzuki, K.; Miyanaga, N.; Ohashi, S.; Dobashi, T.; Kotani, T.; Suzuki, K.; Shimada, T.
***Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi]*** 20 (5) 317–322 (1979) [5 ref. Ja, en] [567, Marunouchi Building, Chiyoda-ku, Tokyo, Japan]

A method for AAS detn. of Pb in canned vegetable juice was collaboratively studied in 8 laboratories. The ash obtained by dry-ashing a sample at 450°C was dissolved in 6N HCl. After concn., the residue was dissolved in 1N HCl. Pb was extracted from this solution with potassium iodide-methylisobutylketone (MIBK). This MIBK solution was stable in the absence of water for 3 days. Presence of Sn in test solutions did not interfere with Pb detn. Average recoveries of 2.5 µg and 5.0 µg of added Pb were 97.0% and 100.6%, resp. Mean s.d. for Pb detn. in the presence of 36 p.p.m. and 122 p.p.m. of Sn were 0.043 p.p.m. and 0.049 p.p.m., resp. The precision and accuracy of this collaborative procedure were deemed acceptable and this method was recommended by the Joint Working Group for AAS detn. of Pb in canned vegetable juice. AS

## 69

**[Heavy metals pollution. III. Pb contents in juices of lemons from variously polluted regions.]**
Caristi, C.; Cimino, G.; Ferlazzi, A.
***Essenze Derivati Agrumari*** 50 (3) 172–177 (1980) [8 ref. It, en] [Istituto di Clinica Organica dell' Univ., Messina, Italy]

Pb contents were determined in the soil, leaves, lemon peel and centrifuged lemon juice from 3 Sicilian citrus-growing areas with very different levels of industrial development, traffic density and urbanization. Tabulated results showed Pb levels of 7.9–33.4 p.p.m. (180–858 $mg/m^2$) in the soil, 1.3–22.1 p.p.m. in the leaves, 1.1–5.9 p.p.m. in the peel, and mean values of 13–46 parts/billion in the juice. While there were no dangerously high Pb levels in the centrifuged lemon juice, the results showed that Pb is very widely distributed in the environment. RM

## 70

**[Contamination of milk with lead.]** Kontamination der Milch mit Blei. [Lecture]
Vetter, H.; Mählhop, R.; Meyer, H.-H.
***Deutsche Tierärztliche Wochenschrift*** 87 (6) 235–236 (1980) [De] [Landwirtschaftliche Untersuchungs- & Forschungsanstalt der Landwirtschaftskammer Weser-Ems, Oldenburg, Federal Republic of Germany]

The Pb concn. in milk is correlated with the Pb content of the feed and was experimentally increased to 0.5 mg/l; this compares with an average concn. of approx. 30 µg/l. Hence the daily consumption of 1 l milk would only contribute 7% of the max. permissible intake as stated by the FAO/WHO. [See FSTA (1981) 13 9P1584.] BR

## 71

**Lead pellets in Danish cattle.**
Clausen, B.; Haarbo, K.; Wolstrup, C.
***Nordisk Veterinaermedicin*** 33 (2) 65–70 (1981) [9 ref. En, da] [Statens Vet. Serumlab., Bülowsvej 27, DK-1870 Copenhagen V, Denmark]

Possible contamination of edible tissues of cattle with Pb derived from lead shotgun pellets from fields where the animals graze, or from which silage is produced, is discussed. Reticulum contents of 415 randomly selected cattle from a slaughterhouse in West Zealand were examined over the period Dec. 1976–Jan. 1978. Reticulum contents of 230 (55%) contained lead pellets (1–55/reticulum). Average number of pellets/animal was 4.9 (total wt. 0.47 g) in the animals carrying lead pellets. Most pellets were smaller and lighter than unused pellets, implying erosion of the ingested pellets. Data are presented for Pb concn. in 16 livers and 21 kidneys of cattle with lead pellets in the reticulum, together with samples from 5 cattle without lead pellets. No significant difference in kidney or liver Pb concn. was found between animals with and those without lead pellets in the reticulum; Pb concn. in the tissues was not related to number of lead pellets in the reticulum. AJDW

## 72

**[Determination of typical values for Pb in agricultural produce by regression analysis.]**
Pertoldi Marletta, G.; Gabrielli Favretto, L.
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** 10 (1) 41–48 (1981) [14 ref. It, en] [Istituto di Merceologia, Univ. di Trieste, Trieste, Italy]

Application of linear regression analysis techniques to estimation of the relationship between Pb concn. in crops and their distances from a road is discussed in detail, with the aid of an example based on data for Pb in vine leaves, grapes and soil from vineyards. AJDW

## 73

**[Contents of heavy metals in foods produced in Hokkaido.]**

Sato, C.; Yamamoto, I.; Osanaga, H.; Sato, Y.

***Report of the Hokkaido Institute of Public Health [Hokkaidoritsu Eisei Kenkyusho Ho]*** No. 30, 87–88 (1980) [Ja]

Contents of As, Pb, Cd, Cu, Zn, and Mn are tabulated for wheat, azuki beans, potato, burdock, radish leaves and root, spinach, chinese cabbage, pumpkin, cucumber, tomato, strawberries, apples, pears, grapes, shiitake mushrooms, nameko and konbu (172 samples) produced in Hokkaido. BWH

## 74

**[Determination of Zn, Cu, Cd and Pb in water by means of acetylene/air flame AAS.]** Zur Bestimmung von Zn, Cu, Cd und Pb in Wässern mittels Atomabsorptionsspektrometrie in der Acetylen-Luft-Flamme.

Schumann, H.

***Zeitschrift für die Gesamte Hygiene und ihre Grenzgebiete*** 26 (10) 706–710 (1980) [50 ref. De, en, ru] [Hygiene-Inst., Martin-Luther-Univ., Halle-Wittenberg, German Democratic Republic]

Use of AAS for detn. of Zn, Cu, Cd and Pb in water requires a preliminary concentration process. The most frequently used concentration methods are extraction, ion exchange and distillation; distillation is the simplest, but also results in concentration of other constituents which may influence the intensity of the absorption signal. These matrix effects were evaluated in a multi-factor programme which took into consideration 8 cations and anions; they may be eliminated by the use of calibration curves. Recoveries from spiked samples were: Zn 92%, Cu 98%, Cd 92% and Pb 115%; corresponding variation coeff. were 1.8%, 2.8%, 4.1% and 5.1% resp. IN

## 75

**Predicting drinking water lead levels.**

Bailey, R. J.; Russell, P. F.

***Environmental Technology Letters*** 2 (2) 57–66 (1981) [7 ref. En] [Water Res. Cent., Medmenham Lab., PO Box 16, Medmenham, Marlow, Bucks SL7 2HD, UK]

An alternative approach (to random sampling of water) to the problem of assessing exposure of individuals to Pb in drinking water is presented. The feasibility of predicting distributions of Pb concn. by combining stagnation curve information with information on household water use patterns is demonstrated. This is examined as the behaviour of the service pipe and household plumbing (stagnation curve) and the behaviour of the consumer (water use patterns). This approach offers potential justification for fixed stagnation time sampling methods, vs. random sampling procedures. LH

## 76

**[Reduction of flavour and colour changes in citrus (Satsuma) segments in lacquered cans.]**

Catala, R.; Duran, L.; Giner, V.

***Revista de Agroquimica y Tecnologia de Alimentos*** 19 (4) 533–540 (1979) [14 ref. Es, en] [Inst. de Agroquimica y Tecnologia de Alimentos, Valencia, Spain]

Methods of reducing undesirable colour and flavour changes in canned satsuma tangerines during storage in lacquered cans were investigated. The following cans were used: (i) unlacquered; (ii) completely lacquered; (iii) partially lacquered, with a 1 cm wide unlacquered band; (iv) as (iii) but with a 2 cm wide band; (v) as (ii) but with 750 p.p.m. ascorbic acid; (vi) as (ii) but with 50 p.p.m. $Sn^{2+}$ (as $SnCl_2$); (vii) as (ii) but containing a plate of pure Sn, 0.5 × 5 cm. Changes in colour, flavour and metal contents of the product during 12–18 months storage at room temp. were determined and results are shown graphically and in tables. The best sensory grading was obtained in (iv), (vi) and (ii). Corresponding Sn contents in the above 3 products after 18 months were 115.5, 76.0 and 114.0 p.p.m., vs. 173.0 and 52.0 in (i) and (ii), Fe contents 4.1, 2.3 and 8.8, vs. 5.2 and 3.2, Pb contents 0.58, 0.40 and 0.72 vs 0.38 and 0.88 (but 0.42, 0.28 and 0.30 vs. 0.36 and 0.52 after 12 months) resp. RM

## 77

**[Distribution of Pb and Cd in wheat plants grown on polluted soils.]**

Il'in, V. B.; Stepanova, M. D.

***Agrokhimiya*** No. 5, 114–119 (1980) [11 ref. Ru] [Inst. Pochvovedeniya i Agrokhimii SO AN SSSR, Novosibirsk, USSR]

Spring wheat var. Novosibirskaya 67 was grown on 2 types of soil, each spiked with $Pb(NO_3)_2$ or $CdSO_4$. Pb and Cd contents were then determined by AAS in the leaves and roots (at the tillering stage) and in fully ripe grain, and contents were in the following order: roots > leaves > grain (data tabulated). A max. permissible Pb concn. of 4–5 mg/kg was recommended for leaves of the wheat plant during grain production; higher concn. caused toxicosis in the plants. This concn. does not however apply when the green parts of the plant are used for animal feeds. RAW

## 78

**[Evaluation of mercury, cadmium and lead accumulation in commercial fish from the public health viewpoint.]**

Petukhov, S. A.

***Rybnoe Khozyaistvo*** No. 7, 70–71 (1980) [Ru] [VNIRO, USSR]

On the basis of the average fish consumption in the USSR in the yr 1970–1977 (17.1 kg per head of population) and on the basis of the average content of heavy metals in fish, it was calculated that the consumption of Hg amounted to 39.2 μg representing 13.1% of the permitted consumption, that of Cd to

21 µg, which is 5.3% of the amount permitted, and 140.7 µg of Pb representing 4.7% of the permitted level. It was established that even in the case of higher consumption of fish products no health danger threatened but caution was recommended with respect to the purity of the inside of tanks for fish transport and storage. STI

## 79

**[Lead content of beef muscle and liver.]**
Masek, J.; Matyas, Z.
***Veterinarni Medicina*** 25 (10) 621–625 (1980) [15 ref. Cs, ru, en, de] [Vyzkumny Ustav Vet. Lekarstvi, 62132 Brno, Czechoslovakia]

182 emergency slaughter samples of muscle from fore and hind parts of beef carcasses, and 183 liver samples obtained in Feb.–March 1978 in North Moravia (mostly from Frydek-Mistek) were wet-ashed, and Pb was determined by AAS. Mean values with s.d. were resp. 0.28 ± 0.19 and 0.39 ± 0.29 mg/kg fresh tissue. SKK

## 80

**[Contamination of foods and feeds in the Erfurt district with Pb and Cd. II. Contamination of crops in the vicinity of a source of Pb pollution and a control area.]** Untersuchungen zur Kontamination von Lebens- und Futtermitteln ausgewählter Gebiete des Bezirkes Erfurt mit Blei und Cadmium. II. Zur Belastung pflanzlicher Anbauprodukte im Bereich eines Bleiemittenten in bezug auf ein Vergleichsgebiet.
Engst, R.; Beckmann, G.; Lauterbach, K.; König, R.
***Nahrung*** 25 (2) 175–184 (1981) [52 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

Using the inverse voltammetry method described in part I [see FSTA (1980) 12 5C254] 126 feedstuff samples and 86 grain samples (spring and winter barley, winter wheat, oats) were examined for Pb and Cd contents. Contamination levels were directly dependent on distance from the source of pollution (a Pb processing plant): 11 of 55 samples from the polluted area contained >0.5 mg Pb/kg fresh matter. As expected, there was no correlation between Cd and Pb contents. Results were compared with samples from a control area (39 feed and 31 grain samples). Contamination primarily resulted from air pollution and not from the soil. Conclusions are drawn on the agricultural use of the soil in Pb-polluted areas. Studies on the food chain are to be continued. IN

## 81

**[The agricultural significance of heavy metals.]** Die pflanzenbauliche Bedeutung von Schwermetallen.
Kampe, W.
***Verbraucherdienst*** 25 (12) 267–272 (1980) [1 ref. De] [Landwirtschaftliche Untersuchungs- & Forschungsanstalt, Speyer, Federal Republic of Germany]

Aspects discussed include: the present situation in relation to heavy metals in foods; toxicity of heavy metals; dietary requirement for low concn. of some heavy metals; sources of contamination (with reference to heavy metal concn. in the soil, air and sewage sludge, proprietary fertilizers, and pesticides); differences in heavy metal uptake between different plants and different spp. of edible fungi; practical implications; and the potential for reduction of heavy metal concn. occurring in foods. AJDW

## 82

**Analysis of trace metals in orange juice.** [Lecture]
McHard, J. A.; Foulk, S. J.; Jorgensen, J. L.; Bayer, S.; Winefordner, J. D.
***ACS Symposium Series*** 143, 363–392 (1980) [70 ref. En] [Dep. of Chem., Univ. of Florida, Gainesville, Florida 32611, USA]

Methods for detn. of mineral elements in orange juice are presented together with some comparative data showing the similarities and differences which occur especially between orange juices from Florida and Brazil. Some statistical representations are given to show how these differences may be used as fingerprints of geographical origin of the juices. [See FSTA (1981) 13 11J1587.] AL

## 83

**Uptake of lead by vegetable foodstuffs during cooking.**
Little, P.; Fleming, R. G.; Heard, M. J.
***Science of the Total Environment*** 17 (2) 111–131 (1981) [12 ref. En] [Environmental & Medical Sci. Div., AERE, Harwell, Oxfordshire OX11 ORA, UK]

Using an 18 cm diam. enamelled saucepan, 60 g fresh wt. of vegetable (carrot, potato, fresh and frozen peas, and cabbage) was boiled until tender in 250 ml water, to investigate Pb pickup. Effect of hard, soft and distilled water, presence and absence of salt, and addition of stable Pb carrier was studied, as was effect of Pb deposition in the saucepan on subsequent pickup by low pH foods, i.e. rhubarb, baked beans and spinach. It was demonstrated that vegetables and rice cooked in water containing Pb could absorb up to 80% of Pb, depending on the concn. of Pb in water, type of vegetable, water hardness, salting of water, duration of cooking, and available surface area of vegetables. Pb was deposited on saucepan surfaces (greatest deposition occurred on Al surfaces, then enamel, then teflon), and could lead to desorption into other foods. Dietary significance of Pb adsorption by foods is discussed. LH

## 84

**Cadmium in Swedish winter wheat. Regional differences and their origin.**
Andersson, A.; Pettersson, O.
***Swedish Journal of Agricultural Research*** 11 (2) 49–55 (1981) [26 ref. En] [Dep. of Soil Sci., S-750 07 Uppsala, Sweden]

Studies were conducted on Cd concn. in winter wheat of several var. from 2 regions of Sweden: (i) 49 samples from western and southern Skane and (ii) 58 samples from the region of Uppland-Västmanland immediately north of Lake Mälaren. Most of the samples studied were from the 1979 harvest, the rest from the 1978 harvest. All samples were analysed for Cd and Zn, and 40 (i) samples were also analysed for Pb. Graphs and block diagrams of results are given. Mean values and ranges for Cd concn. were (ng/g dry wt.): (i) 96 and 53–171; and (ii) 61 and 28–132. Average Zn concn. in wheat grain from (i) and (ii) resp. were 28.3 and 31.3 µg/g dry wt. The Cd:Zn ratio in wheat grain was 1:503 for (i) and 1:813 for (ii). Annual and cv. differences in Cd concn. in wheat concn. are discussed, together with factors responsible for the regional differences. Pb concn. were < 100 ng/g dry wt. in (i) samples. AJDW

## 85

**Environmental lead toxicity in cattle.**
Bhat, R. V.; Krishnamachari, K. A. V. R.
***Bulletin of Environmental Contamination and Toxicology*** 25 (1) 142–145 (1980) [7 ref. En] [Food & Drug Toxicology Res. Cent., Nat. Inst. of Nutr., Indian Council of Med. Res Jamai-Osmania PO, Hyderabad-500007, India]

Lead ore has been mined for 10 yr in Bandamotu village in the Guntu district of Andhra Pradesh, India. Effluent from the lead processing plant built 2 yr ago flows into a stream that joins a large reservoir. Recently there have been cases of Pb poisoning in cattle that drink from the stream. A preliminary study of the area showed Pb levels (p.p.m.) of 75 in the effluent, 24–183 in the soil, 0.1–0.5 in the village well water, 4.7–38 in cow dung and 0.05–0.15 in milk samples from farms using the stream water for their cattle. MEG

## 86

**[Heavy metals in fish.]**
Sapunar, J.; Jusic, M.
***Prehrambeno Tehnoloska Revija*** 17 (1) 28–30 (1979) [14 ref. Sh, en] [Zavod za Zastitu Zdravlja SR Hrvatske, Yugoslavia]

Mean values with ranges for contents of Hg, Pb and Cd resp. determined by AAS using Pye Unicam SP 90A apparatus were (mg/kg, numbers of samples in parentheses): white sea-fish excluding cod, 0.098 and 0.019–0.352 (29), 0.13 and 0.01–0.55 (30), and 0.035 and 0.001–0.086 (31); cod, 0.057 and 0.014–0.23 (89), 0.25 and 0.01–0.72 (46), and 0.028 and 0.001–0.075 (40); mackerel, 0.064 and 0.017–0.17 (30), 0.25 and 0.01–0.7 (12), and 0.012 and 0.001–0.051 (10); tuna, fresh, 0.700 and 0.163–1.6 (38), 0.28 and 0.01–1.58 (28), and 0.039 and 0.01–0.16 (24); freshwater fish (not specified), 0.118 and 0.024–0.28 (49), 0.29 and 0.01–1.98 (88), and 0.029 and 0.001–0.075 (86); canned tuna (fillets and tuna with vegetables), 0.587 and 0.16–1.67 (70), 0.48 and 0.01–2.38 (24), and 0.025 and 0.001–0.09 (26); and canned sardines in oil, 0.171 and 0.063–0.58 (41), 0.22 and 0.01–1.59 (32), and 0.064 and 0.001–0.328 (32). The tuna was from the eastern Mediterranean, and 77–100% of the high (> 0.5 mg/kg) quantities of Hg were in the methyl mercury form. SKK

## 87

**Trace elements in *Mytilus edulis* L. from the estuary and gulf of St Lawrence, Canada: lead and cadmium concentrations.**
Cossa, D.; Bourget, E.
***Environmental Pollution, A*** 23 (1) 1–8 (1980) [36 ref. En] [Inst. Nat. de la Recherche Sci., INRS-Oceanologie, 310 Avenue des Ursulines, Rimouski, Quebec, Canada]

Cd and Pb in mussels (*M. edulis*) from the St. Lawrence estuary and the N.W. Gulf of St. Lawrence were determined. Soft parts of each mussel were prepared and subjected to AAS. Cd concn. was 1.12–3.20 µg/g dry tissue, and Pb concn. 0.5–4.1 µg/g, depending on location, growth rate and sexual maturity of the mussels. LH

## 88

**Changes in the mineral composition of food as a result of cooking in 'hard' and 'soft' waters.**
Haring, B. S. A.; Delft, W. van
***Archives of Environmental Health*** 36 (1) 33–35 (1981) [14 ref. En] [Nat. Inst. for Water Supply, Netherlands]

Water from taps in The Hague, Wageningen, Zutphen, Arnhem, Maastricht and Kerkrade was sampled, analysed for hardness, pH, minerals and conductivity, and 250 ml was used to cook 150 g of potatoes, carrots, cauliflower and endive. After cooking, the vegetables were freeze-dried and ground for analysis, and remaining water was also analysed for mineral content. Results are tabulated. Ca concn. usually rose in vegetables cooked in hard water and fell in those cooked in soft water; Mg was lost from food in all cases, though to a slightly greater extent in soft water; Pb levels followed the pattern of Ca; Fe, Mn, K and Zn levels were lower after cooking in all cases. Addition of salt to the cooking water had no significant effect on these results. These findings are related to cardiovascular disease incidence. LH

## 89

**Spectrophotometric microgram determination of lead.**
Jaiswal, P. K.; Rao, R. K.
***Journal of the Indian Chemical Society*** 57 (2) 236–237 (1980) [4 ref. En] [Food Res. & Standardization Lab., Navyug Market, Ghaziabad-201 001, India]

Pb, as $Pb(NO_3)_2$, was allowed to form a brown complex with KCN (1 ml, 10%) and $Na_2S$ (0.5 ml, 10%) in an ammoniacal medium (3 ml $NH_3$ solution, sp. gr. 0.91). The contents of the test-tube were diluted to 50 ml, and the absorbance was measured at 290 nm. Solutions containing 1–12 µg Pb/ml obeyed Beer's law. The method is suitable for determining Pb content at p.p.m. levels in foodstuffs. The complex decomposes on standing, so that absorbance has to be measured within 10–20 min after complex formation. CFTRI

90

**[Investigations in Hessian beers. VII. Determination of trace elements in bottom-fermented 'Voll' beers.]**
Untersuchungen an hessischen Bieren. VII. Ermittlung des Gehalts einiger Spurenelemente in untergärigen Vollbieren.
Thalacker, R.
***Monatsschrift für Brauerei*** 33 (10) 401–405 (1980) [De, en, fr] [Staatliches Chem. Untersuchungsamt, D-6300 Giessen, Federal Republic of Germany]

Data are presented for concn. of Cd, Pb, Cu and Hg (determined by flameless AAS) in a total of 55 samples of bottled export and Pilsener beers from 29 breweries in Hesse. Mean values with ranges were (mg/l): Cd 0.004 and 0.001–0.006; Pb 0.044 and 0.02–0.08; and Cu 0.085 and 0.04–0.35; all samples contained <0.0005 mg Hg/l. None of these values present any health hazard. [See *Monatsschrift für Brauerei* (1978) 31, 344 for part VI.] TUB-IGB

91

**Extension of analytical calibration curves in atomic absorption spectrometry.**
Harnly, J. M.; O'Haver, T. C.
***Analytical Chemistry*** 53 (8) 1291–1298 (1981) [18 ref. En] [Beltsville Human Nutr. Res. Cent., USDA, Beltsville, Maryland 20705, USA]

Wavelength modulation with a continuum source and a high-resolution polychromator permits intensity measurements to be made at predetermined intervals across the analyte absorption profile. From these intensity measurements a series of absorbances can be computed from a single atomization. The method is described and its application to analysis of trace metals in orange juice is mentioned. AL

92

**[Polarographic determination of heavy metals in milk samples.]**
Eder-Trifunovic, J.; Kozar, S.; Trifunac, M.
***Prehrambeno Tehnoloska Revija*** 17 (1) 25–27 (1979) [6 ref. Sh, en] [Zavod za Analiticku Kemiju, Tehnoloski Fak., Zagreb, Yugoslavia]

Mean values for 3 series of 5 samples each of market milk determined using a Southern Harwell MK II polarograph after wet-ashing were resp. (μg/l): Cd 0.56, 0.56 and 0.56, Pb 5.8, 2.0 and 13.7, and Cu 51.8, 31.8 and 19.0. Equivalent values for chocolate milk were Cd, 0.22, 0.56 and 1.30, Pb 5.4, 8.3 and 6.2, and Cu 356, 495 and 445. The high content of Cu in chocolate milk is ascribed to leaching out of the metal from the Tetrapak container. SKK

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FAB 28

# CONTENT AND ANALYSIS OF LEAD IN FOODS

SELECTED FROM VOLUME 14
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

**under the direction of:-**

Commonwealth Agricultural Bureaux, Farnham Royal, Slough; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

# INTRODUCTION

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Titles of the FABs now available are given on the back cover of this booklet. For up-to-date lists of FABs or suggestions for new topics please write to the address on the back cover. New subjects are searched for at least the five most recent volumes of Food Science and Technology Abstracts. Thereafter each FAB is updated monthly. Copies of each months abstracts on any topic may be obtained as indicated on the back cover of this publication. At the end of each volume of up-dating, the abstracts are merged and made available as a separate supplement to the original FAB.

Some of the larger FABs have been divided into sections to facilitate use. FAB 47 also has a subject and author index provided.

Copies of all original articles referred to in the abstracts may be bought ( or occasionally borrowed) from the International Food Information Service. A form for ordering these is provided at the end of this FAB.

Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES
EDITOR

1

**[Pb and Tl determination in the μg/g and ng/g ranges in biological samples by mass spectrometric isotope dilution analysis.]** Pb- und Tl-Spurenbestimmung im ppm- bzw. ppb-Bereich in biologischem Material durch massenspektrometrische Isotopenverdünnungsanalyse.
Heumann, K. G.; Kastenmayer, P.; Zeininger, H.
***Zeitschrift für Analytische Chemie*** **306** (2/3) 173–177 (1981) [11 ref. De, en] [Univ. Regensburg, Universitätsstrasse 31, D-8400 Regensburg, Federal Republic of Germany]

An analytical procedure is described for the estimation of Pb in the μg/g range and Tl in the ng/g range in biological samples by MS isotope dilution analysis. Pb contents in various plant samples were 20–70 μg/g with relative s.d. 0.6–4.5%; Tl contents in plant samples were 35–232 ng/g, s.d. ± 4–11 ng/g, and in dried milk 8.2 ± 1.3 ng/g. RM

2

**[Self-protection of consumers: avoidance of the uptake of excess amounts of heavy metals from food.]** Möglichkeiten des Selbstschutzes der Verbraucher vor der Aufnahme vermeidbarer Schwermetallmengen über Lebensmittel.
Käferstein, F. K.; Klein, H.
***Bundesgesundheitsblatt*** **23** (3) 32–35 (1980) [8 ref. De, en] [Zentrale Erfassungs- und Bewertungsstelle für Umweltchemikalien (ZEBS) des Bundesgesundheitsamtes, Postfach, 1000 Berlin 33]

High Cd levels averaging approx. 1 mg/kg fresh wt. were found in kidneys of swine and cattle. One kidney portion would contain 30% of the WHO max. tolerated weekly intake. Although the relevance of frequent consumption of kidneys to health from the toxicological viewpoint has not been resolved, it is recommended that kidneys from cattle and swine only be consumed infrequently (at 2–3 wk intervals). Hg levels in the liver of hares were found to be clearly in excess of those found in other foods commonly considered to contain high Hg levels, e.g. fish, non-cultured mushrooms, edible offals. Consumption of hare liver is thus not recommended. Common culinary preparations such as cleaning and washing may reduce the Pb content of fruit and vegetables by up to 50%; such measures are recommended before consumption of any fruit and vegetables. [From En summ.] JRR

3

**[Heavy metal intake from food.]**
Schwermetallbelastung durch Lebensmittel. [Lecture]
Käferstein, F. K.
***Landwirtschaftliche Forschung, Sonderheft*** No. 36, 316–321 (1980) [7 ref. De, en, fr] [ZEBS, Bundesgesundheitsamt, D-1000 Berlin 33]

The intake of Pb, Cd and Hg by the German population is reviewed. Foods (including drinking water) are important sources of heavy metal intake. Using a model based on the 'Composite method', the average adult intakes of Pb, Cd and Hg in the Federal Republic of Germany were calculated to be about 40%, 70% and 35% resp. of the WHO provisional tolerable levels. [See FSTA (1982) 14 1A23.] RM

4

**[Contamination of plants with heavy metals.]**
Schwermetallkontaminationen bei Pflanzen. [Lecture]
Kampe, W.
***Landwirtschaftliche Forschung, Sonderheft*** No. 36, 322–335 (1980) [28 ref. De, en, fr] [Landwirtschaftliche Untersuchungs- & Forschungsanstalt Speyer, Obere Langgasse 40, D-6720 Speyer, Federal Republic of Germany]

Health hazards due to heavy metal contamination of crops are reviewed, with sections on sources of contamination, contamination factors (transfer from soils into plants), and decontamination (effects of technological treatment). Heavy metal contents currently measured in plant material are 0.002–0.106 mg/kg for Cd, 0.004–0.751 for Pb, 0.001–0.016 for Hg. Total diet studies using moderately contaminated products (0.049 mg/kg Pb, 0.016 Cd, 0.001 Hg) suggested a weekly consumption of 118, 39 and 3.2 μg/person (vs. FAO/WHO tolerances of 3.5, 0.525 and 0.350 mg/wk resp.). [See FSTA (1982) 14 1A23.] RM

5

**[Influence of processing on the heavy metal contamination of foods.]** Beeinflussung der Schwermetallkontamination von Lebensmitteln. [Lecture]
Bielig, H. J.; Hofsommer, H. J.
***Landwirtschaftliche Forschung, Sonderheft*** No. 36, 353–364 (1980) [53 ref. De, en] [Inst. für Lebensmitteltech., Tech. Univ. Berlin, Königin-Luise-Strasse 22, D-1000 Berlin 33]

This review discusses the effects of unit operations, i.e. washing, blanching, crushing, separation and mixing, clarification, preservation, packing and storage, in relation to their decontamination effects. Several fields of food technology are discussed. Washing and its parameters are discussed in detail, as this is one of the most effective decontamination measures. As an example of processing from harvest to storage, apple juice production is described to show the effects on heavy metal contents. The effect of canning on Pb and Sn contamination is discussed; the important parameters are pH, composition of the can contents, storage time and temp., and type and quality of the cans. Technological possibilities for more effective decontamination and their limitations are discussed. [From En summ.] [See FSTA (1982) 14 1A23.] RM

6

**Sampling procedure and determination of lead in canned foods.**
Suddendorf, R. F.; Wright, S. K.; Boyer, K. W.
***Journal of the Association of Official Analytical Chemists*** **64** (3) 657–660 (1981) [6 ref. En] [FDA, Div. of Chem. & Physics, Washington, DC 20204, USA]

A method is presented for improving within-can homogeneity and simplifying the detn. of Pb in canned foods. The entire content of a canned food product is blended with 2N $HNO_3$ and allowed to stand 16 h; then the sample is again blended and a subsample is taken. The subsample is digested by wet ashing using $HNO_3/HClO_4$ or $HNO_3/H_2SO_4/H_2O_2$. The pH of the sample is adjusted with ammonium hydroxide, and the Pb is extracted into butyl acetate as the pyrrolidinecarbodithioate complex. Pb concn. is determined by flame AAS. Recoveries of Pb ranged from 92 to 104% for added 100-mesh Pb particulate. Within-sample variability for green beans was reduced from 37% obtained with blending alone to 3.7% using the proposed procedure at the 3.1 µg/g added Pb level. Variability was 7.6% at the 0.68 µg/g level and 16.4% at the 0.20 µg/g level of added Pb. The use of $HNO_3/H_2SO_4/H_2O_2$ for digestion has the advantage of not forming a precipitate during the neutralization step, as occurs when $HNO_3/HClO_4$ is used for dissolution. AS

7

**[Relation between location and heavy metal contents of vegetables.]** Zusammenhang zwischen Standort und Schwermetallgehalt in Gemüse. [Lecture]
Venter, F.
***Landwirtschaftliche Forschung, Sonderheft*** No. 36, 336–342 (1980) [26 ref. De] [Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

Heavy metal analyses in vegetables and corresponding soils from different growing areas showed that heavy metal concn. in vegetables was generally dependent on location of production, although the metal contents in the plants were not clearly affected by relatively low contents in the soil. Addition of sewage sludge to sandy and loamy soils in pot experiments significantly increased the concn. of EDTA-soluble heavy metals in soils and plants; this effect varied between species and was particularly high in lettuce. In all the vegetable species, the metal concn. were highest in the leaves, followed by roots and tubers and finally by fruits. [See FSTA (1982) 14 1A23.] RM

8

**[Lead contents of vine leaves and fruit growing beside a motorway.]**
Skafida, S.; Voulouvoutis, N.; Soulis, T.
***Connaissance de la Vigne et du Vin*** 14 (4) 239–246 (1980) [12 ref. Fr, en, de, es, it] [Lab. de Chimie Organique Tech. et de Chimie des Aliments, Univ. de Thessaloniki, Greece]

The Greek limit set for Pb in foods is 2 p.p.m., but content in growing plants varies considerably, according to factors such as distance from highway and configuration of land. Resistance to contamination is not the same in all parts of a plant; in the vine, grapes are less affected than leaves. Tests were carried out in 1977 with white Razaki table grapes grown in a vineyard in Macedonia abutting a motorway (carrying 2000 vehicles/day). Samples, each consisting of 200 grapes and 50 leaves, were taken at 14 points 4–250 m from the road, and their Pb content was determined by AAS. Pb contents (mg/kg) at the roadside and at 250 m, resp., were 17.36 and 5.65 for the leaves, and 3.37 and 0.43 for the fruits. The role of the configuration of the land surface in the variations in Pb contents is discussed. KME

7

**Lysimeter and field studies on land application of wastewater sludges.**
Webber, M. D.; Soon, Y. K.; Bates, T. E.
***Water Science and Technology*** 13 (2) 905–917 (1981) [16 ref. En] [Wastewater Tech. Cent., Environment Canada, Burlington, Ontario L7R 4A6, Canada]

Lysimeter and field studies were undertaken in Ontario to determine the effects on crop yield and quality and on groundwater quality of land application of sludges containing Al, Fe and Ca added to remove P from wastewater. Concn. of Cd, Zn, Cu, Ni, Pb and Cr were determined in crops (including wheat grain and corn) grown on soils treated with sludge and commercial fertilizer; results are discussed and shown in histogram form. Results indicated that large increases in trace metal contents in crops occurred only where sludge applications greatly exceeded the amounts recommended. AL

8

**[Concentrations of some essential and non-essential trace elements in various organs of fattening pigs.]** Untersuchungen über die Konzentration einiger essentieller und nicht-essentieller Spurenelemente in verschiedenen Organen von Mastschweinen. [Lecture]
Schenkel, H.; Berschauer, F.; Gaus, G.
***Landwirtschaftliche Forschung, Sonderheft*** No. 36, 307–315 (1980) [26 ref. De, en, fr] [Univ. Hohenheim, Postfach 106-06100, D-7000 Stuttgart 70, Federal Republic of Germany]

22 fattening pigs of different breeds were examined for Fe, Zn, Cu, Mn, Cd and Pb concn. in the liver, muscles, and kidneys (medulla and cortex) and for carry-over from the feed. Tabulated results showed the highest metal concn. in the liver (except for Cd), with mean concn. of the 6 elements (µg/g DM) 485.3, 230.4, 82.8, 11.8, 0.097, 0.244 in liver, 64.2, 104.1, 5.85, 0.407, 0.013, 0.122 in muscle, 201.5, 117.6, 38.8, 7.04, 0.856 and 0.221 in kidney (1.15 -1.84 times higher in the cortex than in the medulla). Cd and Pb concn. did not exceed the German health guide values, and were not affected by breed. The effects of breed on other elements (Fe, Zn, Cu, Mn) require confirmation with larger numbers of animals. Feeding rations with 0.048 p.p.m. Cd and 0.41 p.p.m. Pb (DM basis) resulted in ½ the feed concn. of Pb in liver, kidney and muscle, but 20 times the feed Cd concn. in kidney and 2 times the feed concn. in liver. [See FSTA (1982) 14 1A23.] RM

9

**Atomic-absorption spectroscopic determination of lead in biological materials by direct solid microsampling.**
Favretto, L.; Petoldi Marletta, G.; Gabrielli Favretto, L.
***Mikrochimica Acta*** I (5/6) 387–398 (1981) [22 ref. En, de] [Inst. of Commodity Sci., Univ. of Trieste, I-34100 Trieste, Italy]

Graphite surface atomization was used in AAS detn. of Pb in biological materials (seaweed, vine leaves and the edible portion of mussels), by the slurry technique and in solutions of ashed samples. A hyperbolic calibration graph is adopted, which can be linearized, allowing matrix interferences on the calibration graphs to be assessed by analysis of variance for the linear regression applied to standard additions. The procedure suggested showed that for sampling mussel as a slurry, the analytical sensitivity for Pb is approx. ⅓ of that for standard solutions. A physical loss of metal before the residue can be decomposed to atomic Pb is suggested as a major mechanism. This decrease in sensitivity does not occur with slurries of seaweed or of leaves, or with solutions of ashed materials. Both methods show an accuracy comparable to that of macro- and semimicro reference procedures. AS

## 10

**Sources of lead pollution.** [Review]
Gloag, D.
***British Medical Journal*** 282 (6257) 41–44 (1981) [32 ref. En] [British Med. Journal, London WC1 9JR, UK]

Sources of Pb discussed in this review are air, food, drinking water, dust, soil and paint. Pb in the environment comes mainly from petrol and, to a lesser extent, from industrial processes. The section on Pb in food covers the following aspects: Pb content of the UK diet; Pb solder in cans; Pb-glazed containers and pewter containers as sources of Pb; importance of food as a source of Pb; contamination of crops by airborne Pb derived from petrol; uptake by crops of Pb in soil; and persistence of Pb in crops. The section on Pb in drinking water discusses the following topics: Pb plumbing and Pb solder as sources of Pb; Pb concn. in drinking water in the UK; Pb contamination of food cooked in water; recommended limits for Pb levels in water; relationship between blood Pb concn. and Pb levels in water; and the possibility of raising water pH to lower blood Pb levels. JA

## 11

**Lead contents of commercially canned single-strength orange juice stored at various temperatures.**
Nagy, S.; Rouseff, R. L.
***Journal of Agricultural and Food Chemistry*** 29 (4) 889–890 (1981) [11 ref. En] [Florida Dep. of Citrus, IFAS, Univ. of Florida, Lake Alfred, Florida 33850, USA]

Pb contents of commercially canned single-strength orange juice varied within a narrow region (0.02–0.32 mg/kg of juice). Analysis of 168 samples showed that only 4 samples exceeded by 0.01–0.02 p.p.m. the stringent tolerance level of 0.3 p.p.m. established by FAO/WHO for canned baby juices. No statistical relationship was observed between storage temp. and Pb content with commercial samples. Data suggest that the variability in Pb contents of commercially canned orange juice was primarily due to the amount of solder (splashing and seepage through the side seam) exposed to the juice. AS

## 12

**[Lead content in water sources and its effect on the development of experimental atherosclerosis.]**
Vodichenska, Ts. S.; Dinoeva, S. K.
***Gigiena i Sanitariya*** No. 11, 69–72 (1980) [14 ref. Ru] [Inst. of Hygiene & Professional Diseases, Sofia, Bulgaria]

Animal trials were conducted on the effect of Pb in water at concn. slightly higher than its max. permissible concn. [MPC] of 0.05 mg/l, on the development of experimental atherosclerosis; lead, in the form of acetate dissolved in water, was administered with cholesterol. From the results it was concluded that a concn. of 4 × MPC (0.2 mg/l) had no effect, but that concn. of 200 × MPC (10 mg/l) and 40 × MPC (2 mg/l) furthered the development of cholesterol atherosclerosis. RAW

## 13

**Trace metal levels in Queensland dairy products.**
Mitchell, G. E.
***Australian Journal of Dairy Technology*** 36 (2) 70–73 (1981) [23 ref. En] [Otto Madsen Dairy Res. Lab., Hamilton, Queensland 4007, Australia]

Trace metal concn. were determined by AAS in samples of market milk and a range of dairy products (skim milk, cream, flavoured milk, salted butter, casein, dried skim milk, yoghurt, Cottage cheese, Cheddar cheese, dairy dessert) from 33 Queensland dairy factories, 1 sample of each dairy product being taken from each factory once every 3 months over a 12-month period. Mean values + s.e. for 94 homogenized market milk samples were (p.p.m.): Cd, 0.006 ± 0.003; Cr, 0.017 ± 0.0006; Cu, 0.233 ± 0.0069; Fe, 0.729 ± 0.0251; Pb, 0.039 ± 0.0014; and Zn, 4.878 ± 0.0858. Results for Hg were all <0.002 p.p.m. and for Ni were <0.01 p.p.m. No significant geographical differences were found, but significant seasonal differences were found for Cd, Cr, Fe and Pb with the highest results generally recorded in the winter. Concn. of Cd, Cr, Cu, Fe, Pb, Ni and Zn in 31 samples of Queensland raw goats' milk taken throughout the yr were resp. (p.p.m.): 0.002, 0.013, 0.287, 0.427, 0.035, <0.01 and 4.756. Ranges of metal concn. (p.p.m.) in the milk products were: for Cd, <0.002 (in cream) to 0.082 (casein); Cr, 0.017 (cream) to 0.190 (casein); Cu, 0.082 (butter) to 1.470 (dried skim milk); Fe, 0.681 (butter) to 9.050 (casein); Pb, 0.037 (cream) to 0.163 (casein); Zn, 3.422 (cream) to 45.104 (Cheddar cheese). Hg concn. were <0.002 and Ni concn. <0.01 p.p.m. All concn. were comparable with those reported in other countries. DMK

## 14

**Lead in preserved duck eggs: field screening test and confirmation and quantitation by atomic absorption spectrophotometry and anodic stripping voltammetry.**
Krinitz, B.; Tepedino, N.
***Journal of the Association of Official Analytical Chemists*** 64 (4) 1014–1016 (1981) [6 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

Analysis of preserved duck eggs in this laboratory by acid digestion and AAS has shown that addition of lead salts to the egg coating to speed the preservation process results in Pb in the egg albumen and yolk. The Pb levels decrease as the Pb passes through successive membranes, i.e., the Pb level in the yolk is lower than that in the albumen. A method was developed for the field screening of preserved duck eggs for the presence of Pb in which a portion of the egg coating is shaken with 4% acetic acid, and the resulting solution is tested by a modification of the AOAC dithizone method. A quantitative method for laboratory confirmation of Pb in egg albumen and/or yolk was also developed in which Pb is determined by AAS or anodic stripping voltammetry after closed-system Teflon-cup digestion with nitric acid.   AS

### 15

**[Seasonal variation in heavy metal content of the edible portion of short-neck clam, *Tapes japonica*.]**
Kumagai, H.; Saeki, K.
***Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi]*** 46 (7) 851-854 (1980) [17 ref. Ja, en] [Yamaguchi Prefectural Res. Inst. of Health, Aoi, Yamaguchi City 753, Japan]

In order to elucidate seasonal variation in heavy metal content of benthos [bottom flora and fauna] inhabiting the shallow waters unaffected with industrial waste disposal, total Hg, Se, Zn, As, Cu, Co, Cd, Cr, Pb, Mn and Ni were determined in the edible portion of short-neck clam obtained at Aio-cho in Yamaguchi Prefecture during 1977-1979. A seasonal variation with a max. in winter was found in levels of Hg, Co, Cd, Cr, Pb, Mn and Ni, whereas seasonal consistency was observed in the levels of Se, Zn, As and Cu.   AS

### 16

**[Pb and Hg concentrations in canned fish and molluscs in dependence on sauce type.]**
Sanchez, J. J.; Martin Seco, M.; Santos, M. D.; Cirugeda, M. E.; Granizo, E.
***Boletin del Centro Nacional de Alimentacion y Nutricion*** No. 3/4, 3-4 (1980) [9 ref. Es, en] [Servicio de Analisis Instrumental, Cent. Nat. de Alimentacion y Nutr., Majadohonda, Madrid, Spain]

A total of 402 samples of canned fish or molluscs was analysed for Pb by flame AAS, and for Hg by cold vapour AAS. Tables of results are given. Overall, 7.8% of the 90 samples of molluscs had Pb concn. above the legal limit (5 p.p.m.); 7.4% of the 312 samples of fish products had Pb concn. above the legal limit of 3 p.p.m. Samples canned in 'marinade' sauce more commonly exceeded the legal limits for Pb than those canned in other media; 30% of 61 samples of fish and molluscs canned in marinade sauce had Pb concn. >3 p.p.m., vs. only 6% of samples canned in other media. None of the samples studied had Hg concn. exceeding the legal limit of 1 p.p.m.   AJDW

### 17

**[Contents of some metals in squids *(Loligo vulgaris* and *Illex illecebrosus).*]**
Gajewska, R.; Nabrzyski, M.
***Roczniki Panstwowego Zakladu Higieny*** 31 (2) 169-171 (1980) [8 ref. Pl, ru, en] [Zaklad Bromatologii, AM, Gdansk, Poland]

Mean values with ranges for metal contents (μg/100 g) of samples of whole squid (species no stated); 16 samples of squid with skin removed, packaged in polyethylene bags and manufactured by PPDiUR 'Odra' factory in Swinoujscie (Poland); and of squid dishes, 2 samples of 'squid tripe', 4 samples of 'squid in broth' and 4 samples of 'squid in Greek sauce' from the Polish market in polyethylene packs were resp.: Hg, 1.4 (1.1-3.5), 1.2 (1.0-2.0), 3.0 (no range), 1.0 (0-2.1), and 1.0 (0-2.1); Cd 258 (144-520), 38 (13-75), 10 (no range), 17.5 (10-25), and 9 (no range); Pb, 7.8 (2.5-15.8), 5.8 (0.7-15), 5 (no range), 5.2 (2-8.3), and 11.2 (10-12.3); Zn, 1808 (1080-2507), 1226 (900-1720), 1860 (no range), 1890 (1780-2000), and 930 (900-960); and Cu 695 (380-1346), 125 (65-175), 143 (no range), 210 (185-235), and 124 (100-148).   SKK

### 18

**[Content of metals in meat additives.]**
Polic, M.; Djulic, I.; Bastic, L.
***Tehnologija Mesa*** 21 (9) 253-255 (1980) [11 ref. Sh, en] [Jugoslovenski Inst. za Tehnologiju Mesa, Belgrade, Yugoslavia]

Studies were conducted to determine concn. of essential metallic elements (Fe, Ca, Mg, Na, K, Mn, Cu, Co, Zn) and toxic metals (Pb, As, Sb, Hg, and Cd) in curing brine, various protein preparations, spices, monosodium glutamate, smoke concentrates and glucono-δ-lactone. Tables of data are given for concn. of metals in these additives.   STI

### 19

**Concentration of cadmium, copper, selenium, zinc and lead in tissues of New Zealand cattle, pigs, and sheep.**
Solly, S. R. B.; Revfeim, K. J. A.; Finch, G. D.
***New Zealand Journal of Science*** 24 (1) 81-87 (1981) [En] [Wallaceville Anim. Res. Cent., Min. of Agric. & Fisheries, Upper Hutt, New Zealand]

Cd, Cu, Zn and Pb were determined by AAS in kidney and liver samples of cows, sheep and pigs; Se was determined by the fluorometric method of Watkinson [*Analytical Chemistry* (1966) 38, 92-97]. Current New Zealand tolerance levels for these 5 elements are 1, 30, 40, 2 and 2 mg/kg, resp. Results indicate that for Cu and Zn levels in liver these tolerances are not realistic (Cu level in cattle liver was 78 mg/kg, in sheep 155 and in pig 13; Zn levels were correspondingly 61, 54 and 103 mg/kg). Other levels generally complied with tolerance values.   LH

## 20

**[Determination of Pb and Cd distribution in bovine liver, in relation to appropriate sampling technique.]**
Beurteilung der Blei- und Cadmiumverteilung in der Rinderleber unter dem Gesichtspunkt einer geeigneten Probenentnahme.
Holm, J.
***Fleischwirtschaft*** 61 (7) 1053–1055 (1981) [7 ref. De, en] [Staatliches Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, D-3300 Braunschweig, Federal Republic of Germany]

Livers from 1 animal from an area with low pollution, 1 animal from an area with normal pollution and 5 animals fom polluted areas were used. Pb and Cd concn. (determined by AAS) in samples from 7 defined sites in each liver were compared with concn. in mixed liver homogenates, prepared from each liver. Tables of results are given. Results for the individual samples and the homogenates agreed well for the animal from an area with low pollution. Livers from animals from polluted areas show a non-uniform distribution of Pb. Optimization of sampling of livers for heavy metal analysis is discussed; it is suggested that the *lobus caudatus* should be used; this location can be specified clearly in sampling instructions, and gives results agreeing well with the mean values of other sites, and of composite samples. AJDW

## 21

**[Effects of increasing Pb levels on performance of fattening pigs and on carry-over in several tissues. II. Pb residues in several tissues.]**
Vemmer, H.; Petersen, U.
***Landwirtschaftliche Forschung*** 33 (4) 424–435 (1980) [13 ref. De, en] [Inst. für Tierernährung der Forschungsanstalt für Landwirtschaft, Bundesallee 50, D-3300 Braunschweig, Federal Republic of Germany]

100 fattening pigs were fed a diet containing 2.0–616 mg Pb/kg (Pb additions 0.30–614 mg/kg air dry feed) from live wt. 17 kg up to slaughter at 103 kg, wher Pb concn. in ribs, renal cortex, liver, muscles and subcutaneous fat were determined. Results, shown graphically and in tables, revealed a linear increase in Pb contents of the tissues with increasing dietary Pb level (from 2.0 mg onwards in soft tissues, from 8.8 mg in ribs). Pb concn. in muscle rose from 0.433 to 0.743 mg/kg DM, in subcutaneous fat from 0.010 to 0.166, in liver from 0.483 to 96.3, in renal cortex from 0.579 to 157.0 and in ribs from 1.23 to 777.0. Results are discussed in relation to permitted max. in complete feeds for fattening pigs. [See FSTA (1980) 12 S568 for part I.] RM

## 22

**[Flameless atomic absorption determination of lead and cadmium in poultry products.]**
Martynyuk, T. G.; Sevast'yanova, N. I.; Nikolaeva, V. A.; Mukhtarov, E. I.
***Voprosy Pitaniya*** No. 2, 16–19 (1981) [4 ref. Ru] [Nauchno-proizvodstvennoe Ob"edinenie Ptitsepererabatyvayushchei i Kleezhelatinovoi Promyshlennosti 'Kompleks', Moscow, USSR]

Variations in the AAS technique (e.g. use of $HNO_3$, HCl or aqua regia for ashing) were assessed in determining Cd and Pb content in chicken muscle and liver tissues and in hens' egg samples; possible sources of error (e.g. effect of background absorption) are also discussed. A comparison was also made between detn. by a calibration method and a standard reference method (good agreement was obtained between the 2 methods). Recoveries from samples spiked with 0.25–1 mg Pb/kg or 0.050–0.200 mg Cd/kg, and method reproducibility are also tabulated (the latter was lower than levels reported elsewhere in the literature). RAW

## 23

**Non-alcoholic carbonated beverages. Determination of arsenic and lead contents.**
**Oman,** Ministry of Commerce & Industry
***Omanian Standard*** **OS 30/1980, 5 + 7pp. (1980)** [En, Ar]

Reagents, apparatus, and procedures are given for detn. of As and Pb in non-alcoholic carbonated beverages. AL

## 24

**Lead-glazed pottery: a potential health hazard in the Middle East.**
Acra, A.; Dajani, R.; Raffoul, Z.; Karahagopian, Y.
***Lancet*** 1 (8217) 433–434 (1981) [10 ref. En] [Dep. of Environmental Health, Fac. of Health Sci., American Univ. of Beirut, Beirut, Lebanon]

Because of the acid nature of many traditional foods in the Middle East, and the frequent use of lead-glazed pottery for food preparation and serving, content of extractable Pb in commercial pottery was assayed. 275 samples of glazed pottery were obtained from (i) rural primitive potteries and 75 samples from (ii) a modern industrial pottery (all in Lebanon) and Pb extracted into 4% acetic acid at room temp. in 24 h was determined; this was (mg/l) (i) 97.67 (0.3–200) and (ii) 3.82 (0.8–9.6). This compared with 0.42 (range 0.0–6.0) for 73 samples of pottery imported (mainly from Italy and Korea) into the Lebanon. Most of the (i) samples were unacceptable by the standards of the FDA in the USA, and various control measures, such as use of different glazes, and limiting production by rural potters to ornamental articles, are discussed. DIH

## 25

**[Elimination of lead in cows' milk.]**
Milhaud, G.; Enriquez, B.
***Recueil de Medecine Veterinaire*** 157 (3) 291–296 (1981) [14 ref. Fr, en, es] [Ecole Nat. Vet. d'Alfort, 94704 Maisons-Alfort, France]

Blood and a.m. milk samples were taken on 22 Jan. 1979 from 168 cows on 18 small farms near a lead factory, and on 12 Oct. 1979 from 186 cows on 19 farms (17 farms and 90 cows being sampled twice). Range of Pb content in milk was 0.01–0.1 p.p.m. in Jan. and 0.03–0.2 p.p.m. in Oct. Regression equations between Pb content in milk ($y$) and in blood ($x$) were for Jan. $y = 0.117x + 0.005$, and for Oct. $y = 0.192x + 0.047$. The overall average of 0.07 p.p.m. was below the WHO recommended limit for Pb intake of 1.4 mg/wk from 1 l milk/day. JMD

### 26

**[Inverse-polarographic determination of trace elements (Cd, Pb, Cu, Sn) in evaporated milk.]**
Inverspolarographische Bestimmung von Spurenelementen (Cd, Pb, Cu, Sn) in Kondensmilch.
Mrowetz, G.
***Milchwissenschaft*** 36 (8) 479–481 (1981) [4 ref. De, en] [Inst. für Chem. & Physik, Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

The method consists of ashing 1 g evaporated milk in a quartz crucible for 3 h at 500°C. The ash is dissolved in 0.2 ml concn. $H_2SO_4$, diluted with 10 ml water and used for the polarographic detn. of Cd, Pb and Cu. The solution is mixed with 5 ml conc. HCl for the detn. of Sn. Detection limits for Cd, Pb, Cu and Sn were resp. 0.005, 0.017, 0.012 and 2.6 mg/kg. Examination of 12 different samples of evaporated milk showed that the Cd content was below the detection limit, Pb contents ranged from 0.13 to 1.60 mg/kg, Cu from 0.20 to 0.58 mg/kg and Sn from <2.6 to 115 mg/kg. Samples from cans with a protective varnish had the lowest contents of Pb and Sn. [See also FSTA (1981) 13 1P16.] AS

### 27

**A survey of heavy metals in the surf clam, *Spisula solidissima*, and the ocean quahog, *Arctica islandica*, of the mid-Atlantic coast of the United States.**
Wenzloff, D. R.; Greig, R. A.; Merrill, A. S.; Ropes, J. W.
***Fishery Bulletin, National Oceanic and Atmospheric Administration*** 77 (1) 280–285 (1979) [16 ref. En] [Northeast Fisheries Cent. Milford Lab., Nat. Marine Fisheries Service, NOAA, Milford, Connecticut 06460, USA]

Heavy metals (Ag, As, Cd, Cu, Zn, Cr, Hg, Ni, and Pb) were determined in (i) surf clams and (ii) ocean quahogs from 151 locations. Concn. of Cd, Cu, Pb, and Zn in both spp. were well below recommended max. concn., but the limit of 1.14 p.p.m. As was exceeded at all but a few sampling stations, overall mean being 2.1 p.p.m. for (i) and 3.0 p.p.m. for (ii). Hg concn. were well below FDA action limits. Average concn. of Ag, As, Cd, Cu and Zn were higher in (ii) than in (i) for the entire survey. JRR

### 28

**[Studies of cattle reared in an area polluted by industrial emissions of lead, zinc and cadmium.]**
Milhaud, G.; Pinault, L.; Parent, B.
***Recueil de Medecine Veterinaire*** 155 (12) 955–962 (1979) [9 ref. Fr, en, es] [Ecole Nat. Vet. d'Alfort, 94704 Maisons-Alfort Cedex, France]

32 cows were studied for 2.5 yr in an industrially polluted region. Average daily Pb intake was 1.1–6.3 mg/kg. Pb contents of liver and kidney from slaughtered animals were 1.1–9.2 and 0.4–100 p.p.m., resp. DIH

### 29

**Sample preparation methods for the analysis of metals in foods by atomic absorption spectrometry – a literature review.** [Review]
Blake, C. J.
***Scientific and Technical Surveys, Leatherhead Food RA*** No. 122, 53pp. (1980) [many ref. En, fr, de] Price Members £5.50 Non-members £10.00 [Leatherhead Food RA, Randalls Road, Leatherhead, Surrey, UK]

This survey reviews methods which have been published in the literature for the preparation and treatment of samples of food prior to the determination of trace metals by AAS. The survey is divided into 2 parts: Destruction of organic matter (pp. 4–14); and Preparation methods for specific foodstuffs (pp. 15–34). The first part of the survey covers: wet oxidation, rapid acid extraction methods, automatic digestion systems, digestion bombs, microwave treatments, dry ashing, $O_2$-flask combustion, low temp. dry ashing, separation and concn. Part I ends with a treatment of the practical aspects of making AAS measurements, covering flame and flameless AAS. Part II outlines methods of sample preparation and treatment for the following classes of foods: beers; canned foods; cocoa powder; eggs; fish and seafoods; flavouring materials; food colours; fruit juices and soft drinks; plant materials; instant coffee; meat and meat products; milk and dairy products; oils and fats; spices; sugars; tea; and wines and spirits. VJG

### 30

**[Migration of lead from ceramic glazes.]**
Merat, E.; Duret, M.; Grenak, N.; Vogel, J.
***Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene*** 72 (3) 359–362 (1981) [3 ref. Fr, de, en] [Lab. Cantonal de Chimie, Inst. d'Hygiene, 22 Quai Ernest Ansermet, CH-1211 Geneva, Switzerland]

A 'do-it-yourself kit' for potters to assay the Pb released from their products that are intended for food use is described; the assay method is based on a previously described rapid screening method [see FSTA (1979) **11** 4C234]. The kit is available for potters in Geneva from the cantonal laboratory. As well as developing the kit, in a campaign to survey Pb migration from non-industrially-produced ceramic ware, the cantonal laboratory analysed such articles at a reduced price; results of these analyses are presented. A total of 1549 articles were analysed; of these, 186 (12.0%) released >3 mg Pb/$cm^2$ surface (equivalent to 5 mg/l in the extracting solution), thus contravening Swiss guidelines for ceramic ware. DIH

### 31

**[Variation in lead content of products in tin cans.]**
D'Arrigo, V.
***Industrie Alimentari*** 20 (4) 261–263 (1981) [6 ref. It] [Docente Merceologia Istituto Economico-Aziendale, Univ. di Modena, Modena, Italy]

In view of the problem of possible migration of Pb from tinplate into canned foods and the current lack of adequate Italian legislation, tests were carried out on 5 samples of peas from each of 14 different canneries on sale in Italian shops in July and Oct. 1980, for comparison with frozen uncanned samples, and on 15 samples of 3 kinds of beans from 10 different canneries, for comparison with 3 dried uncanned samples of each of the 3 kinds; wt. of drained product and of liquid fill, % of dry residue, ash and total NaCl, and Pb content were determined in each case. Results (fully tabulated) showed without exception more Pb in the canned product than in the controls (canned peas: range, 0.95–2.85 µg/g DM vs. frozen peas: 0.42–0.70; canned beans: 1.45–3.20 µg/g DM vs. dried beans: 0.54–0.68). A more precise statement of max. tolerance for Pb in foods is required in Italy, and a limit of migration compatible with such tolerance should be set. KME

## 32

**The fate of heavy metals in the Ruhr system and their influence on drinking water quality.**
Imhoff, K. R.; Koppe, P.
***Water Science and Technology*** 13 (3) 211–225 (1981) [18 ref. En] [Ruhrverband, Kronprinzenstrasse 37, 4300 Essen 1, Federal Republic of Germany]

The fate of heavy metals in the Ruhr basin is described from factory to drinking water. Weekly averages of B concn. and temp. are shown for Ruhr water and drinking water at Essen in June–Nov. 1979. It was calculated from average B concn. in river water and groundwater that >90% of the groundwater is infiltrated river water. Tables show retention of Ni, Mn, Zn, Cu and Pb in Ruhr water and drinking water at waterworks at Witten and Essen, and concn. of B. Alterations of heavy metal concn. in Essen water (1973–1976) between waterworks and tap are shown; average concn. (µg/l) of Cu and Ni increased from 9.2 (waterworks) to 62 (tap) and from 6.7 to 13 resp., Zn was reduced, surprisingly, from 71 to 42, and no alteration was detected for Pb (<5), Cr (<5) and Cd (<1). It is emphasized that heavy metals in Ruhr water involve problems which need permanent consideration and work in order to ensure future drinking water supply. AL

## 33

**Response of lead solubility to dissolved carbonate in drinking water.**
Schock, M. R.
***Journal American Water Works Association*** 72 (12) 695–704 (1980) [44 ref. En] [USEPA, Cincinnati, Ohio, USA]

A revised model is presented showing the detailed response of the theoretical solubility curves for Pb to changes in dissolved inorganic carbonate concn. and pH at 25°C, as related to domestic water supplies being pumped via Pb piping, and the associated deleterious health effects. Previous solubility models, theoretical considerations, and experimentation are discussed and further work is recommended, as application of the equation arrived at may not be possible in many instances. LH

## 34

**Maternal lead levels after alterations to water supply.**
Moore, M. R.; Goldberg, A.; Fyfe, W. M.; Richards, W. N.
***Lancet*** 2 (8239) 203–204 (1981) [16 ref. En] [Univ. Dep. of Med., Western Infirmary, Glasgow, UK]

A study was made of Pb concn. in tap water in Glasgow and of blood Pb concn. in mothers in a post-natal hospital ward. In 1977 tap-water pH was 6.3, >50% of random daytime samples contained >0.48 µmol Pb/l (the WHO standard concn.), and median blood level was 0.8; 7.5% of the mothers had blood levels >1.5 µmol Pb/l. In 1980, after lime-dosing of the water to give a pH of 9 in the water supply (8 at the tap), it was estimated that >95% of water samples would have concn. <0.48 µmol Pb/l. Median blood level in 1980 was 0.32 µmol/l and only 0.4% had concn. >1.5 µmol/l. DIH

## 35

**Lead, cadmium, and mercury contents of fungi in the Helsinki area and in unpolluted control areas.**
Kuusi, T.; Laaksovirta, K.; Liukkonen-Lilja, H.; Lodenius, M.; Piepponen, S.
***Zeitschrift für Lebensmittel-Untersuchung und -Forschung*** 173 (4) 261–267 (1981) [28 ref. En, de] [Tech. Res. Cent. of Finland, SF-02150 Espoo 15, Finland]

Wild-growing fungi, mainly edible types, were collected from (i) Helsinki urban area (242 samples) or (ii) rural locations in Finland (84 samples). More than 40 spp. were represented, both saprophytes and mycorrhizal symbionts being included. Tabulated data show number of samples of each sp. collected, and means and ranges of Pb, Cd, and Hg contents, as determined by AAS. *Agaricus* spp. and the Gasteromycetes (with saprophytes) had high metal contents in both (i) and (ii), highest levels observed being 78 mg Pb/kg DM, 101 mg Cd/kg DM and 95 mg Hg/kg DM. Mean contents for each sp. were in the following ranges (mg/kg DM) for saprophytes and mycorrhizal fungi, resp.: Pb (i) 1.7–16.8, (ii) <0.5–13.0; (i) 0.5–8.9, (ii) <0.5–3.6; Cd (i) 0.5–11.9, (ii) 0.2–16.8; (i) <0.2–17.3, (ii) 0.3–4.1; Hg (i) 0.11–14.1, (ii) 0.07–4.2; (i) 0.02–4.14, (ii) 0.02–0.73. In general, saprophytes had higher metal contents than did mycorrhizal fungi, especially in (i), and (i) samples had higher metal contents than did those from (ii); in the case of saprophytes this was always very significant if *Agaricus* spp. were excluded, as these tended always to accumulate high metals contents. It is concluded that, as the bulk of edible fungi collected in Finland are mycorrhizal symbionts from rural sites, there is little danger to human health from heavy metals, although moderation in use of *Agaricus* spp. is recommended. DIH

## 36

**Copper and lead levels in crops and soils of the Holland Marsh area - Ontario.**
Czuba, M.; Hutchinson, T. C.
***Journal of Environmental Quality*** 9 (4) 566–575 (1980) [41 ref. En] [Dep. of Botany, Univ. of Toronto, Ontario, Canada]

A study was made of the occurrence, distribution, and concn. of heavy metals Cu and Pb in the soils and crops of the important horticultural area north of Toronto known as the Holland Marsh. Cultivation seems to have elevated Cu levels, and depressed Pb levels relative to uncultivated areas. Cu and Pb levels found in the crops were generally higher in the young spring vegetables than in the matura fall ones. Leafy crops, especially lettuce *(Lactuca* sp.*)* and celery *(Apium graveolens)* accumulated higher Pb levels in their foliage compared with levels in root crops. JRR

## 37

**[Heavy metals in long-life bakery products. Determination of Pb and Cd by flameless AAS.]**
Untersuchungen über den Schwermetallgehalt von Dauerbackwaren. Bestimmung von Blei und Cadmium mittels flammenloser AAS.
Knezevic, G.

***Zucker- und Süsswarenwirtschaft*** 34 (7/8) 242, 244 (1981) [8 ref. En] [Fraunhofer-Inst. für Lebensmitteltech. & Verpackung, Schragenhofstrasse 35, 8000 Munich 50, Federal Republic of Germany]

11 samples of various long-life bakery products (biscuits, rusks, wafers, etc.) were analysed for Pb and Cd by flameless AAS. Tables of results are given. Pb concn. ranged from 0.92 to 0.14 mg/kg; Cd concn. ranged from 0.01 to 0.06 mg/kg. These values were well below the Bundesgesundheitsamt limiting values for Pb and Cd in cereals. AJDW

### 38

**[Catalysis by precious metals in lipid chemistry. III. Isomerization reactions of ethylenic fatty acids catalysed by supported precious metals.]**

Cecchi, G.; Ucciani, E.

***Revue Francaise des Corps Gras*** 28 (6) 257–262 (1981) [18 ref. Fr, en, de, es] [ITERG, Univ. d'Aix-Marseille, 13397 Marseille Cedex 13, France]

The isomerization produced during hydrogenation of unsaturated oils by Ru, Rh, Pd and Pt catalysts on C and alumina supports was investigated. Interesting results were obtained by $Rh/Al_2O_3$ and Ru/C, especially in the conjugation of linoleic and linolenic acids. Detailed studies with the Ru/C catalyst showed that it can achieve 70% conversion of linoleic acid with good selectivity for sunflower oil, >90% conversion of linolenic acid for rapeseed and soybean oil. Some minor constituents (peroxides, S compounds) can act as poisons, others (phospholipids, free fatty acids) do not interfere with the reaction. Secondary reactions of the conjugation reaction give rise to by-products (their origin and formation will be further investigated). [See FSTA (1981) 13 5N244 for part II.] AS

### 39

**Residues of meats and additives – studies and perspectives.** (In *'Meat in nutrition and health'* [see FSTA (1982) 14 4S569].) [Lecture]

Ferrando, R.

pp. 151–176 (1981) [88 ref. En] [Lab. of Nutr. & Feeding, Nat. Vet. Coll., Alfort, France]

This review deals with the sources and hygienic risk of residues in meat, under headings of: residues originating from natural contaminants owing to the infestation of the animals' food by microorganisms productive of mycotoxins; residues originating from pesticides used in agriculture and reaching meats by way of the alimentary chain – the case of heavy metals is also examined; residues originating from additives used in animal feed and medication used in veterinary therapy; substances used in the preparation of meat products, especially pork butchery; perspectives raised by the question of residues on material, sanitary and legislative levels, involving the necessity for a total, objective study. LH

### 40

**Ceramic ware in contact with food – release of lead and cadmium – I. Method of test.**

International Organization for Standardization

***International Standard*** ISO 6486/1:1981, 4pp. (1981) [5 ref. En]

A test method is specified to determine the release of Pb and Cd by ceramic ware which may be used in contact with food, e.g. ceramic ware made of china, porcelain and earthenware, whether glazed or not, but excluding glass, glass ceramic and porcelain enamel articles. It applies to ceramic ware which may be used for the preparation, serving and storage of food and beverages, excluding those used in food manufacturing industries or those in which food is sold. The method involves extraction of Pb and Cd by an acetic acid solution from the surfaces which would normally come in contact with food, and detn. by AAS of the amounts of Pb and Cd extracted. [See also following abstr.] AL

### 41

**Ceramic ware in contact with food – release of lead and cadmium – II. Permissible limits.**

International Organization for Standardization

***International Standard*** ISO 6486/2:1981, 2pp. (1981) [5 ref. En]

Permissibe max. limits for Pb and Cd release from 3 types of ceramic ware are, resp.: flatware 1.7 and 0.17 mg/dm$^2$; small hollow-ware 5.0 and 0.50 mg/l; and large hollow-ware 2.5 and 0.25 mg/l. [See also preceding abstr.] AL

### 42

**[Quantitative determination of As, Pb, Cd, Hg and Se in foods by flameless AAS.]** Quantitative Bestimmung von Arsen, Blei, Cadmium, Quecksilber und Selen in Lebensmitteln mit Hilfe flammenloser Atom-Absorptions- Spektrophotometrie.

Müller, H.; Siepe, V.

***Deutsche Lebensmittel-Rundschau*** 77 (11) 392–400 (1981) [6 ref. De, en, fr] [Consumer Res. & Development, Knorrstrasse 1, D-7100 Heilbronn, Neckar, Federal Republic of Germany]

A device developed for wet-ashing of food samples for subsequent analysis by AAS is described in detail; results of recovery studies on various foods are given. Ranges of values for % recoveries were: As 84–98; Cd 92–110; Hg 69–82; Pb 73–94; and Se 85–107.
A procedure for AAS detn. of these elements after extraction as diethylammonium diethyldithiocarbamate derivatives is described in detail; specific AAS conditions for As, Pb, Cd, Hg and Se are given. Detection limits were (parts/billion): As 3; Pb 4; Cd 2; Hg 2–3; and Se 15. This method was used for detn. of As, Cd, Hg, Pb and Se in a wide range of foods; a table of results is given. AJDW

### 43

**[Pb in Lazio wines.]**

Piracci, A.; Spera, G.; Castino, M.

***Vini d'Italia*** 22 (126) 153–158 (1980) [18 ref. It, en] [Istitito Sperimentale per l'Enologia, Velletri, Italy]

A total of 239 samples of Lazio wine, i.e. (i) 41 Frascati D.O.C., (ii) 41 Marino D.O.C.; (iii) 116 Castelli Romani Biancho and (iv) 38 Castelli Romani Rosso were analysed for Pb by AAS of the ash. Tables and block diagrams of results are given. Mean values with ranges were (p.p.m.): (i) 0.221 and 0.16–0.60; (ii) 0.184 and 0.16–0.25; (iii) 0.240 and 0.12–0.49; and (iv) 0.238 and 0.18–0.36. The numbers (with % in parentheses) with Pb concn. exceeding the legal limit (0.3 p.p.m.) were: (i) 6 (13.6%); (ii) 0; (iii) 19 (16.4%) and (iv) 8 (21.0%). The results are briefly considered in relation to sources of Pb pollution. AJDW

## 44

**[Pb and Cd contamination of foods. I. Cereal products.]**

Bolasco, A.; Memoli, A.; Alimonti, A.; Lucarini, C.
***Farmaco, Edizione Pratica*** 36 (4) 223–227 (1981) [12 ref. It, en] [Univ. degli Studi di Roma, Rome, Italy]

Commercial samples of flour, bread, pasta, biscuits, etc. were analysed for Pb and Cd contamination. Tabulated results show a steady rise in contamination from 1974 onwards. Pb concn. ranged from 0.02 to 1.0 p.p.m., Cd from 0.02–0.37 between 1974 and 1977 (published data), while recent results in pasta were 0–2.51 p.p.m. Pb (mean 1.00) 0–0.73 p.p.m. Cd (mean 0.22), in bread 0–2.44 (mean 1.37) and 0.032 (mean 0.16), in other products 0.24–1.97 (mean 1.20) and 0.08–0.37 (mean 0.23) resp. RM

## 45

**Heavy metals in *Mercenaria mercenaria* and sediments from the New Bedford Harbor Region of Buzzard's Bay, Massachusetts.**

Genest, P. E.; Hatch, W. I.
***Bulletin of Environmental Contamination and Toxicology*** 26 (1) 124–130 (1981) [31 ref. En] [Dep. of Biol., Southeastern Massachusetts Univ., North Dartmouth, Massachusetts, USA]

*Mercenaria mercenaria* and sediments collected from several sites in the New Bedford region (the first weekend of every month from April 1978 to March 1979) were analysed for Cd, Cu, Fe, Pb, and Zn. Results showed that Cd and Cu showed no differences according to site. Tissue Fe concn. varied slightly between sites while Pb content was significantly site dependent. Zn values were erratic, site related and had significant interaction between season and site. *M. mercenaria* tissue levels of the 5 metals studied appear to be within safe limits in terms of public health even though Cu approached the permissible levels established for Australia. VJG

## 46

**Distribution and significance of copper, lead, zinc and cadmium in the Corio Bay ecosystem.**

Smith, J. D.; Butlér, E. C. V.; Grant, B. R.; Little, G. W.; Millis, N.; Milne, P. J.
***Australian Journal of Marine and Freshwater Research*** 32 (2) 151–164 (1981) [32 ref. En] [Marine Chem. Lab., School of Chem., Univ. of Melbourne, Parkville, Victoria 3052, Australia]

Levels of Cu, Pb, Zn and Cd were measured in sediments, waters and mussels (*Mytilus edulis*) from Corio Bay (Victoria), a bay known to have received a major input of Cd. The respective concn. of Cu, Pb, Zn and Cd in mussels were 4.8–21, 1.2–9.7, 105–410 and 9.8–53 µg/g on a dry wt. basis. AS

## 47

**[Trap shooting with lead pellets over agricultural land.]**

Christensen, N.; Clausen, B.; Wolstrup, C.
***Dansk Veterinaertidsskrift*** 64 (7) 286–290 (1981) [18 ref. Da, en] [Miljostyrelsen, Strandgade 29, 1402 Copenhagen K, Denmark]

To determine whether lead pellets from trap shooting could constitute a human or animal health hazard, tests were carried out at a minor trap shooting range, from which lead pellets are spread at the rate of approx. 50 kg/10 000 $m^2$ annually. Pb content of soil was unacceptably high in the adjacent areas, and cattle fed for 7 months with beet tops harvested for silage 100–150 m from the site were found at slaughter to carry up to 1314 lead pellets in the reticulum. Treatment of the cattle for diarrhoea was unsuccessful, and it was difficult to get the cows in calf. Pb content of the blood was 10 × higher than normal, and 3 × higher than the level found to cause reproductive disturbances in women and laboratory animals. Pb content of the liver and bones was normal, but the average content in the kidney was twice the average for Danish cattle, although still below the max. accepted level for foods in Denmark. It is concluded that trap shooting with lead pellets may impair the value of land for crop production, perhaps for a considerable time. AS

## 48

**[Cadmium and certain other metals in liver and kidney of elk. Basis for dietary recommendations.]**

Mattsson, P.; Albanus, L.; Frank, A.
***Var Föda*** 33 (8/9) 335–345 (1981) [11 ref. Sv, en] [Livsmedelslab., Statens Livsmedelsverk, 751 26 Uppsala, Sweden]

Cd, Pb, Zn, Cu and Mn were determined in liver and kidneys of elk (*Alces alces*) of various ages, and from various parts of Sweden. Comparative data are given for domestic cattle. Cd concn. in liver and kidney increased markedly with age, and were appreciably higher in elk tissues (up to 2.4 mg/kg wet wt. in liver, up to 13 mg/kg wet wt. in kidneys) than in corresponding tissues of domestic cattle. Considerable differences were found in Cd contents of tissue samples of elk from different parts of Sweden. Concn. of the other metals studied did not differ greatly between elk and domestic cattle tissues. On the basis of the results, it is recommended that adult elk kidneys should not be eaten; that liver from adult moose and kidney from moose calves should be eaten not more than once or twice a month, and that liver from moose calves may be eaten once or twice/wk. Consumption of liver and kidneys from roe deer and hares is also briefly considered. AJDW

## 49

**Metal contamination of food. [Book]**

Reilly, C.
xvi + 235pp. ISBN 0-85334-905-3 (1980) [many ref. En] Barking, Essex, UK; Applied Science Publishers Ltd. Price £17.00 [Queensland Inst. of Tech., Brisbane, Australia]

This book provides a discussion of the part played by metals in human nutrition and health, and their content in foods. Chapters are: A peck of dirt (pp. 3–14, 12 ref.); How metals get into food (pp. 15–45, 63 ref.); Quality control (pp. 46–63, 19 ref.); Food quality – analysis of food (pp. 64–82, 23 ref.); Lead (pp. 85–104, 52 ref.); Mercury and cadmium (pp. 105–122, 48 ref.); The toxic metalloids: arsenic, antimony and selenium (pp. 123–

137, 63 ref.); The packaging metals: aluminium and tin (pp. 138–147, 30 ref.); Transition metals (pp. 148–183, 91 ref.); Other transition metals (pp. 184–189, 15 ref.); Zinc – the unassuming nutrient (pp. 190–196, 21 ref.); Beryllium, strontium, barium and the other metals – summing up (pp. 197–209, 43 ref.). A 9-pp. subject index is included. LH

## 50

**[Adsorption of heavy metal ions on immobilized tannin. Removal of iron ion from water for brewing.]**
Mori, T.; Watanabe, T.; Tosa, T.; Chibata, I.; Iwano, K.; Nunokawa, Y.
***Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi]*** 76 (2) 111–114 (1981) [9 ref. Ja, en] [Res. Lab. of Applied Biochem., Tanabe Seiyaku Co. Ltd., Osaka, Japan]

Immobilized tannin adsorbed Fe, Cu, and Pb ions efficiently. Among Fe ions tested, ferrous, ferric, chelated ions and Fe ions in the presence of organic acid were well adsorbed on immobilized tannin, but ferrichrysin was not so well adsorbed. Adsorption capacity of immobilized tannin for Fe ion was affected by the kind of ion, concn. of Fe, and pH in the adsorption medium. Fe ion adsorbed was easily eluted with 0.5N HCl, and the regenerated immobilized tannin could be used repeatedly without loss of activity. The concn. of Fe ion in column effluent was 10 parts/billion, even when 8.5 l of water for brewing containing 10–40 parts/billion Fe ion was treated with 1 ml of immobilized tannin. YN

## 51

**Lead content in canned foods containing vinegar.**
Moran, J. J.
***Journal of Food Science*** 47 (1) 322–323 (1982) [En] [Dep. of Nutr. & Food Sci., Univ. of Toronto, 150 College Street, Toronto, Ontario M5S 1A8, Canada]

Pb contents of various foods pickled and canned in vinegar (including cucumber, sauerkraut, mixed pickles, leeks, mustard greens), were measured using ion selective analysis and microprocessor unit on pre-nitric acid digested samples. Where possible these values were compared with those of the fresh produce, or the product pickled and stored in jars. In all cases studied, the fresh or bottled products showed levels well below the legal limit of 2 p.p.m. In the case of the canned products all the Pb levels were grossly in excess of the legal limit (5–10 p.p.m.). IFT

## 52

**[Collaborative study on the determination of trace elements in dried sugar beet pulp and molasses. III. Lead.]**
Koster, P. B.; Raats, P.; Hibbert, D.; Phillipson, R. T.; Schiweck, H.; Steinle, G.
***Sucrerie Belge*** 100 (10) 333–340 (1981) [10 ref. Fr, nl, en, de] [Inst. voor Rationele Suikerproductie, PO Box 32, 4600 AA Bergen op Zoom, Netherlands]

The detn. of Pb in dried sugar beet pulp and molasses by flame and flameless AAS was investigated in collaborative studies between the Instituut voor Rationale Suikerproductie (IRS), Süddeutsche Zucker AG and the British Sugar Corporation (BSC). Each laboratory developed its own method of analysis; these are described. Tabulated results show 97–109% recoveries of added Pb, limits of detection 0.1–0.2 mg Pb/kg. Increased Pb contents were observed with decreasing particle size (from 0.1–2.6 mg/kg for the >595 µm fraction, to 2.4–6.9 for <250 µm). Good agreement between methods was shown for 14 samples analysed in the 3 laboratories (s.d. 0.00–0.93 of mean Pb contents from 0.8–4.7 mg/kg). Application to samples obtained from British, Dutch, and German factories between 1972 and 1980 showed mean Pb contents of 1.2–2.3, max. 2.4–6.8 mg/kg pulp (at 12% moisture content), and 0.2–0.8 mg/kg for molasses. (These values are much lower than the proposed EEC standard of 10 mg/kg in 12% moisture animal feeds.) [See FSTA (1979) **11** 12L825 for part II.] RM

## 53

**[Collaborative study on determination of trace elements in dried sugar beet pulp and molasses. III. Lead.]** Gemeinsame Studie über die Bestimmung von Spurenelementen in Zuckerrübentrockenschnitzeln und Melassen. 3. Blei.
Koster, P. B.; Raats, P.; Hibbert, D.; Phillipson, R. T.; Schiweck, H.; Steinle, G.
***Zuckerindustrie*** 106 (10) 895–900 (1981) [14 ref. De, en, fr, es] [Inst. voor Rationele Suikerproductie, PO Box 32, NL-4600 AA Bergen op Zoom, Netherlands]

See preceding abstr. for Fr version. RM

## 54

**[Lead in butter and cheese produced in different zones of the Parmigiano-Reggiano cheese area.]**
Losi, G.; Padovani, I.; Rastelli, R.; Tedeschi, M.
***Scienza e Tecnica Lattiero-Casearia*** 32 (4) 237–250 (1981) [17 ref. It, en] [Istituto di Microbiol. e Ind. Agrarie, Univ., Bologna, Italy]

51 butter and 49 cheese samples from 51 producers in the Parmigiano-Reggiano cheese area were analysed for Pb by AAS. Cheese samples were prepared by the same method as in an earlier study [FSTA (1977) 9 4P667] but butter samples were prepared by a new method involving conversion to methyl esters and removal of the lipid phase. 71–91% and 94–104% of Pb was recovered from spiked samples of butter and cheese resp. Average Pb content of butter was 74 µg/kg (range 30–218) for 17 samples produced near busy roads, 75 µg/kg (24–156) for 17 samples from a ceramics industry zone and 57 µg/kg (20–155) for 17 samples produced in open countryside. In cheese Pb content averaged 73, 98 and 51 µg/kg (33–262, 29–220 and 24–100) for the 3 groups resp. Butter and cheese contained most Pb when produced in summer and least when produced in spring. ADL

## 55

**[Contents of heavy metals in foods produced in Hokkaido. IV. Contents of heavy metals [As, Pb, Cd, Zn, Mn, Hg] in fishes and shellfishes.]**

Yamamoto, I.; Osanaga, H.; Sato. Y.; Sato, C.

***Report of the Hokkaido Institute of Public Health [Hokkaidoritsu Eisei Kenkyusho Ho]*** No. 30, 31–37 (1980) [14 ref. Ja]

In Sept. 1978 and 1979 162 samples of 43 fish spp. were taken from fish markets in Hokkaido. High levels of As were found in chub, dace, 'kurogarei', Pacific cod and slime flounder (*Microstomus achne*), with mean values 40.60, 28.59, 8.43, 8.38 and 7.23 p.p.m. resp. Other fish contained As at 0.24–3.67 p.p.m. Pb was only found at low levels, 96.9% contained <0.04 p.p.m.; the highest Pb content was in 1 sample of cuttlefish 0.17 p.p.m. Scallops, squid and chub contained on average 0.238, 0.205 and 0.049 p.p.m., more than flat fish and 'soi' fish; 0.76 p.p.m. was found in 1 sample of squid. Most samples contained <1 p.p.m. Ca but chub, octopus and squid averaged 3.11–10.83 p.p.m. Levels of Zn ranged from 5–20 times those of Cu, Zn content of 'chika', scallop and squid ranged between 10 and 22 p.p.m.; single samples of octopus and cod roe contained 32.4 and 38.8 p.p.m. resp. Highest levels of Mn were in scallops, 1.06–1.20 p.p.m.; 'sunagarei', scallops, sandfish (*Actoscopus japonicus*) and 'hakki' averaged 0.26–0.51 p.p.m. No fish contained more than the provisional legal limit of Hg (0.4 p.p.m.); the highest level was 0.309 in 1 sample of rock trout (*Hexagrammos otakii*). Highest average levels were in horse mackerel, halibut and rock trout, 0.241, 0.157 and 0.143 p.p.m. In rocktrout, bullhead (*Cottus pollux*), flat fish, mackerel and 'soi' fish there was a positive relationship between body wt. and Hg content. In flat fish there were positive relationships between Hg and As and between As and Zn contents. [See FSTA (1981) 13 10C346 for Part III.] CIH

## 56

**Polychlorinated biphenyl, pesticide, and heavy metal residues in swine foraging on sewage sludge amended soils.**

Hansen, L. G.; Washko, P. W.; Tuinstra, L. G. M. T.; Dorn, S. B.; Hinesly, T. D.

***Journal of Agricultural and Food Chemistry*** 29 (5) 1012–1017 (1981) [36 ref. En] [Dep. of Vet. Biosci., Univ. of Illinois, 1101 W. Paebody, Urbana, Illinois 61801, USA]

Berkshire sows were overwintered (2 seasons) on corn plots that over 9 yr had received cumulative totals of 0, 126, 252 or 504 t DM sewage sludge/ha. Composition of soils is described. Contents of Cd, Cu, Fe, Pb, Mn, Ni and Zn in sow tissues are tabulated; of these only Cd was increased by the sludge treatment, and only in kidney, liver and spleen, reaching max. levels in the 1st 2 tissues of 4.71 and 0.83 mg/k fresh wt., vs 0.35 and 0.03 in controls, resp. Sludge treatment induced traces of Cd binding protein in livers and kidneys. Residues of p,p'-DDE accumulated in fatty tissues in a dose-dependent manner, reaching 101 μg/kg fresh wt. in back fat at the highest sludge application level. Sludge treatment did not lead to accumulation of lindane, heptachlor epoxide or dieldrin. Polychlorinated biphenyls (PCB) accumulated in a dose-dependent manner. Results showed that estimation of PCB content as specific Aroclors by monitoring selected GLC peaks gives misleading results: PCB components were identified by cochromatography with 31 standards; 19 were absent from sow backfat, and >50% of backfat PCB content was accounted for by 3 individual chlorobiphenyls (2,3,4,2',4',5'; 2,4,5,2',4',5'; and 2,3,4,5,2',4',5'). Environmental PCB contamination cannot be related to composition of commercial mixtures and it is recommended that, rather than estimate total PCB concn. by monitoring selected peaks, that perchlorination procedures be used to determine total chlorobiphenyls, or ideally, that PCB composition in samples be precisely characterized from a complete set of standards. Mean total PCB content of backfat at the highest treatment level (sum of 12 individually quantitated PCB) was 300–400 μg/kg fat, vs. <35 μg/kg for controls. DIH

## 57

**[Lead from residues of shot in game.]** Blei aus Geschossrückständen in Wildbret.

Moreth, F.; Hecht, H.

***Fleischwirtschaft*** 61 (9) 1326, 1328, 1330–1332, 1334, 1336; 1367 (1981) [12 ref. De, en] [Bundesanstalt für Fleischforschung, 8650 Kulmbach, Federal Republic of Germany]

The splintering action of various types of shot, and the behaviour of Pb splinters in game meat were examined. X-ray photographs showed that many splinters remained in the meat even after the damaged part (entry of the shot) was cut away. In vitro tests showed $Pb(OH)_2$ precipitates forming around the splinters within 2 days, which were 10 times as soluble in HCl at pH 2 as pure Pb. Light, glancing liver shots also showed quick reaction of Pb with the surrounding medium, increasing the Pb content after 10–12 h storage by several orders of magnitude. Pb concn. were also increased by marinating of meat, from 0.09 mg/kg to 0.50 after 6 days in red wine or wine/oil, 1.97 in vinegar and 12.80 in milk marinade, though the uneven distribution of splinters caused considerable variations in concn. RM

## 58

**[Food products. Spectrophotometric method for determination of lead.]**

**Poland,** Polski Komitet Normalizacji, Miar i Jakosci

***Polish Standard*** **PN-80/A-04011,** 3pp. (1980) [Pl]

## 59

**Heavy metals in foods.**

Dewdney, P. A.; King, C. F.

***Food Legislation Surveys, Leatherhead Food RA*** No. 6, 49pp. (1980) [En] [Price Members £5.00 Non-members £15.00 [Leatherhead Food RA, Randalls Road Leatherhead, Surrey, UK]

A survey is presented of worldwide legislation on the max. levels of heavy metals which are permitted in food and beverages. A guide to the countries which have legislation on permissible levels of arsenic, Cu, Fe, Pb, Hg, Sn and Zn is given in tabular form. Food products and max. levels of heavy metals in them are listed under each country. The countries have been arranged alphabetically under various areas of the world: Europe — EEC countries (Belgium, Denmark, Eire, France, Italy, Luxembourg, Netherlands, UK, West Germany); Europe — Non-EEC countries (Austria, Finland, Malta, Norway, Portugal, Spain, Sweden, Switzerland, Yugoslavia); North America — Canada, USA, South America and Caribbean (Argentina, Brazil, Colombia, Guyana, Jamaica, Trinidad and Tobago, Uruguay); Australasia (Australia, Fiji, New Zealand, Papua New Guinea); Africa (Kenya, Mauritius, Namibia, South Africa, Zambia); Asia (Bangladesh, Hong Kong, India, Japan, Pakistan, Sabah and Sarawak, Singapore, Thailand); and Middle East (Iraq, Israel, Kuwait, Saudi Arabia). Tabulated data give max. levels for As, Cu, Pb and Zn resp. in various foods and beverages for 17 of the countries. A table also presents the max. levels recommended for metal contaminants by the joint FAO/WHO Codex Alimentarius Commission. VJG

## 60

**[Chemical-spectral method for determining micro quantities of lead in spoils, plants and waters.]**
Portnaya, L. V.; Chelnokova, M. N.
*Agrokhimiya* No. 11, 133–135 (1980) [3 ref. Ru] [Permskii Politekhnicheskii Inst., Perms. USSR]

## 61

**[Use of anodic stripping voltammetry for determination of trace levels of lead in canned fruit and vegetable products.]**
Aldini, R.; Leoni, C.; Zanotti, A.
*Industria Conserve* 56 (1) 18–21 (1981) [9 ref. It, en] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

The reliability of anodic stripping voltammetry applied to the detn. of Pb in canned fruit and vegetable products [see FSTA (1978) 10 11H1501] was confirmed. The method proved as sensitive as, but quicker than polarographic and spectrophotometric procedures, since it dispenses with prior digestion of the sample. Analysis of 366 6–18 months old samples from canning factory stores showed Pb levels >0.5 p.p.m. in only 5.4% of samples. Pb concn. were inversely related to can size, with highest concn. in 100, 200 and 300 g cans, i.e. 30.1% >0.4 p.p.m. vs. 9.7% in 500 g and 1 kg, 2.3% in 2.5–5 kg cans. [From En summ.] RM

## 62

**[Pb in canned foods.]**
France, Comite Interprofessionnel de la Conserve
*Medecine et Nutrition* 17 (4) 287–292 (1981) [45 ref. Fr, en] [5, Rue Paul Cezanne, 75017 Paris, France]

Aspects considered include: Pb in foods and the environment; possible contamination of food by Pb from solders; legislation covering Pb in food in various countries; analytical techniques; and measures for reduction of the potential for Pb contamination of foods (with reference to electrical welding of can body seams, and 2-piece cans). AJDW

## 63

**[Heavy metals in foods.]** Schwermetalle in Lebensmitteln.
Anon.
*Seifen-Öle-Fette-Wachse* 107 (17) 524 (1981) [De]

## 64

**Spectrographic determination of the concentration of some elements in the wines.**
Ungurean, M.; Scarlet, G.; Sahlean, V.; Velican, N.; Toma, E.; Iordan, M.; Sahlean, D.; Delibas, M.
*Buletinul Universitatii din Galati, Tehnologia si Chimia Produselor Alimentare* 1, 25–30 (1978) [5 ref. En, ro, fr] [Univ. of Galati, Galati, Romania]

Basic principles of flame AAS are described. Trials were conducted on its suitability for analysis of wines for Cu, Fe, Mg, Pb and Na. Reference solutions of known concn. were analysed; data are tabulated. Sensitivity of the method was found to be good; it is recommended for routine use. Data are given for concn. of the above elements in 8 wines, analysed by this method. AJDW

## 65

**[Lead in wines and other alcoholic beverages.]** [Review]
Colagrande, O.; Silva, A.
*Industrie delle Bevande* No. 56, 451–459 (1981) [59 ref. It, en] [Istituto di Enologia, Univ. Cattolica del Sacro Cuore, Piacenza, Italy]

This detailed review covers Pb content of wines, beer, brandy, grappa, whisky, vermouth and aperitifs. Concn. found were below the limit recommended by FAO. In wines, mean ranges were 0.05–1.41 mg/l; in Italian wines, vintages 1974–1978, the range was 0.14–0.29 mg/l with a max. of 1.38 mg/l in a single sample (authors' own experiments). Since the Pb content of the beverages concerned has an exogenous origin, the authors discuss possible pollution causes and indicate ways of avoiding Pb contamination. [From En summ.] HBr

## 66

**Seasonal levels of chlorinated hydrocarbons and heavy metals in fish and brown shrimps from the Medway Estuary, Kent.**
Broek, W. L. F. van den
*Environmental Pollution* 19 (1) 21–38 (1979) [33 ref. En] [Dep. of Biological Sci., City of London Polytechnic, Old Castle Street, London E1, UK]

The river Medway (UK) is surrounded by industrial areas but is also bordered by cultivated land (particularly orchards); sewage effluents are treated but insecticides and heavy metals may remain. Detn. were made of the contents of a number of pesticides and heavy metals (Hg, Cd, Cu, Pb, Zn) in several spp. of fish (e.g. eel, flounder, whiting, plaice) and brown shrimps, collected from cooling water of a power station intake and covering seasonal variations. Shrimps were analysed whole and fish were divided into lateral musculature, liver, gut wall and gonad. Homogenized samples were dried with anhydrous $Na_2SO_4$, extracted with n-hexane and fractionated by column techniques. For detn. of metals samples were digested with 1:1 $HNO_3$:$H_2SO_4$ for Hg and with $HNO_3$ for other metals, followed by AAS (details given). Quantifiable results were obtained for dieldrin, DDE, DDT, TDE and polychlorinated hydrocarbons (PCH), but values were low with only PCH some times approaching max. limits. Only minute traces were found of aldrin, endrin and α- and β-BHC. Results (showing max.-min. ranges, monthly variations, spp. differences, size and lipid content) are tabulated for DDT, dieldrin and PCH. Pesticide contents of estuary water were very low, with no seasonal variation attributable to spraying activity; there was some evidence of food chain concentration and levels were correlated with the lipid content of tissues. Metal concn. were negligible (background only) and were no higher than in the open sea. ELC

## 67

**[Recommendations for consumption of liver and kidneys.]**

**Sweden,** Statens Livsmedelsverks

***Statens Livsmedelsverks Meddelanden*** **M 8-81,** 2pp. (1981) [Sv]

Possible hazards from high Pb and Cd concn. in liver and kidneys of domestic and game animals are discussed. Recommendations are given for max. weekly/monthly frequency of consumption of liver from pigs, calves, lambs, adult cattle and sheep, hares, and young or old deer. Poultry liver, which does not generally have high Cd or Pb concn., is not considered; nor is liver pate, of which liver forms only a part. AJDW

## 68

**Experiences with various methods of trace analysis in organic matrices, with special reference to lead blank values.**

Ruig, W. G. de

***Mikrochimica Acta*** **II** (3/4) 199–200 (1981) [3 ref. En, de] [State Inst. for Quality Control of Agric. Products, RIKILT, Postbus 230, 6700 AE Wageningen, Netherlands]

Because of its major interest as a food contaminant, the influence of a number of common procedures on the Pb blank value (and hence the detection limit) was studied. The procedures include classical wet digestion; teflon bomb destruction; dry ashing in a muffle furnace with a chamotte or silica chamber; mineralization with a "Tecator" device; low-temp.-plasma ashing; further chemical treatment and measurement by flame or electrothermal AAS, or by differential pulse anodic stripping voltammetry. Limits of detection resulting from the blanks in these methods were tabulated. The sources contributing to the blank values and the risks of ignoring them were also demonstrated. AS

## 69

**Metal accumulation and crop yield for a variety of edible crops grown in diverse soil media amended with sewage sludge.**

Garcia, W. J.; Blessin, C. W.; Inglett, G. E.; Kwolek, W. F.; Carlisle, J. N.; Hughes, L. N.; Meister, J. F.

***Environmental Science & Technology*** 15 (7) 793–804 (1981) [19 ref. En] [N. Reg. Res. Cent., USDA, Peoria, Illinois 61604, USA]

15 crops were grown in randomized field plots on various soils, and the possible benefits and risks of using sewage sludge on these soils for crop production were assessed. Protein, moisture and ash contents were analysed in edible parts of cabbages, beans, onions, beetroots, tomatoes and radishes; metal accumulation (Pb, Hg, Cd, Zn) was evaluated in edible parts of lettuce, tomatoes, onions, radishes and wheat. Results are tabulated. Nutritional quality was not affected by the different soil treatments. Lettuce accumulated high metal levels, and reflected soil metal concn., whereas tomatoes had low metal concn. regardless of soil levels, and would thus be a suitable crop for sludge-amended soils. Sludge was used to more advantage as regards yield on disturbed soils (e.g. coal mine gob). LH

## 70

**[Content of heavy metals in canned products.]**

Mauro, A.; Mazza, S. G.; Grasso, C.

***Industrie Alimentari*** 20 (5) 367–371 (1981) [8 ref. It] [Lab. Chimico Provinciale, Catanzaro, Italy]

Bearing in mind the injurious effect of heavy metals on humans, and the fact that contents may increase as cans age, a system of dating cans of food products seems essential. A technique involving AAS of ashed samples of 316 canned products (peeled tomatoes, tomato concentrate, vegetables, fruit in syrup, juices, fish and meat) is described. 207 of the cans showed no signs of deterioration, the other 109 were blown. Results are quoted in detail, giving max., min., and mean values for 4 ranges of contents (trace, small amounts, substantial amounts, and amounts over permitted limits) for each of 6 metals (Pb, Cu, Fe, Sn, Zn, Mn). Contents of Cu, Mn and Zn tallied with values quoted in the literature. Fe and Sn, the usual bases for standards of acceptability for canned foods, were within permitted limits, except in a few instances of canned meat and fish products, where Fe was excessive. Excessive Pb was found in peeled tomatoes (7 mg/kg) and tomato concentrate (13.5 mg/kg). It is urged, therefore, that legislation be speedily enacted to subject canned products to more stringent control. KME

## 71

**Determination of heavy metals in a menhaden oil after refining and hydrogenation using several analytical methods.**

Elson, C. M.; Bem, E. M.; Ackman, R. G.

***Journal of the American Oil Chemists' Society*** 58 (12) 1024–1026 (1981) [15 ref. En] [Dep. of Chem., Saint Mary's Univ., Halifax, Nova Scotia, Canada B3H 3C3.]

A series of menhaden oils (crude, degummed, degummed + gums, refined, refined and bleached, hydrogenated and filtered, hydrogenated, filtered and bleached, and hydrogenated, filtered, bleached and deodorized), collected at various stages of processing were analysed for Zn, Cd, Pb, Cu and As by wet digestion and electrothermal atomization-AAS. The results are compared, for some metals, with 2 other methods of oil treatment: extraction with $HNO_3$, and dilution with methyl isobutyl ketone. Both the extraction and dilution procedures appeared to measure only the loosely bound, inorganic portion of the metals: detn. of the total metal content including organometallics required wet digestion. The crude oil contained the largest metal burden but successive refining steps reduced the metal content to a level which met the FAO/WHO Codex standards. Hydrogenation did not significantly alter the metal concn. in the oils. AS

### 72

**[Secondary contamination with toxic elements in meat and meat products.]** Sekundärkontamination mit toxischen Elementen in Fleisch und Fleischwaren.
Hecht, H.; Schramel, P.; Moreth, F.; Schinner, W.
***Fleischwirtschaft*** 61 (9) 1316, 1318, 1321–1325; 1365 (1981) [19 ref. De, en] [Bundesanstalt für Fleischforschung, 8650 Kulmbach, Federal Republic of Germany]

Sources of secondary heavy metal contamination of meat and meat products, and their toxicological importance are reviewed, i.e. technological contamination (from machinery, storage containers, processing equipment), additives (herbs, salts, emulsifiers, cutting aids), packaging materials, and special sources (lead shot). While processing equipment did not usually produce significant Pb, Cd and Hg contamination, it could increase levels of Fe, Cu and Zn through abrasion. Contact with Zn-coated surfaces should be avoided. Significant metal residues were produced from lead shot (splinters or abrasions) and should be the subject of further study: 0.11–159 mg/kg Pb, 5.5–59.6 µg/kg Cd, 2.1–10.9 mg/kg Cu were isolated from 20 samples of the diaphragm of shot deer. RM

### 73

**[Contents of lead, mercury and cadmium in the daily diets of children in nursery schools.]**
Koktysz, N.; Bulinski, R.
***Bromatologia i Chemia Toksykologiczna*** 13 (2) 215–216 (1980) [4 ref. Pl] [Zaklad Bromatologii Inst. Anal. i Tech. Farmaceutycznej Akad. Med., Lublin, Poland]

### 74

**[Determination of traces of lead in canned foods.]**
Mergey, C.; Allouf, R.
***Analusis*** 9 (10) 509–516 (1981) [17 ref. Fr, es] [Carnaud Emballage, 65 Avenue Edouard-Vaillant, BP 405, 92103 Boulogne-sur-Seine Cedex, France]

Various improvements are proposed for methods of Pb detn. in analysis of canned foods. These modifications permit detn. of Pb in 360 cans/wk, with a detection limit of 0.02 mg/kg, a precision of 6–7%. Application of the method to 1524 cans from the French retail market gave a mean level of 0.37 mg/kg (max. 3.98 in jams and desserts, 3.32 in fruits and vegetables), which is calculated to contribute 0.21 mg/capita/wk, or 7% of the proposed FAO/WHO acceptable daily intake. The can diam., length of storage and internal lacquering had no significant effect. RM

### 75

**Determination of traces of metals in Finnish margarines by the flameless atomic absorption spectrophotometry method.**
Pihlaja, H.
***Fette Seifen Anstrichmittel*** 83 (8) 294–296 (1981) [16 ref. En, de] [Lappeenranta Univ. of Tech., Box 20, SF-53851 Lappeenranta 85, Finland]

The metal contents (Cu, Fe, Ni, Pb) of Finnish margarines manufactured in 1978–1980 were investigated by flameless AAS. Cu, Fe, Ni were digested by dry ashing, Pb by dry ashing and wet ashing. The addition method was used in AAS analysis. The metal contents were calculated from the total wt. of margarine. Cu content was 0.25–0.35 p.p.m. and Fe 0.28–0.43 p.p.m. (except for one group of margarines which contained 2 p.p.m. Fe). The largest Ni content (0.38 p.p.m.) was found in margarines prepared by catalytic hydrogenation; other margarines contained 0.2 p.p.m. Ni. The amount of Pb was 0.1 p.p.m. except for one sample (0.28 p.p.m.). AS

### 76

**[Distribution of trace amounts of heavy metals in short-necked clam and sludge in Tokyo Bay (1978–1979).]**
Horii, S.; Yamagishi, T.; Miyazaki, T.; Kaneko, S.; Murakami, H.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** 31 (1) 156–160 (1980) [6 ref. Ja] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Short-necked clams were sampled at a number of locations in Tokyo bay in 1978 and 1979 and analysed for contents of 7 heavy metals. Results are tabulated for each location. Overall means for both yr (53 samples), with s.d. (p.p.m., wet basis), are as follows: Pb 0.13 ± 0.11; Co 0.14 ± 0.05; Zn 23 ± 5; Cd 0.04 ± 0.02; Cu 1.1 ± 0.3; Hg 0.104 ± 0.050; As 1.52 ± 0.48. Correlation coeff. between heavy metal concn. are tabulated, as are corresponding data on Tokyo bay sludge. [From En tables.] DIH

### 77

**[Heavy metals in fishery products – a review.]** Die Belastung von Fischereierzeugnissen mit Schwermetallen – ein aktueller Überblick. [Review]
Schreiber, W.
***Archiv für Lebensmittelhygiene*** 32 (5) 145–149 (1981) [many ref. De, en] [Bundesforschungsanstalt für Fischerei, Hamburg, Federal Republic of Germany]

Published data on heavy metal contents in marine and fresh water fish and shellfish products in Germany are reviewed. Tabulated data for Hg, Cd, Ag, As, Zn, Co, Ni, Se, Pb and Cu suggest that there is no need to establish new limits for max. contents. RM

### 78

**[Early detection of harmful metal contamination in live animals.]** Möglichkeiten zur Früherkennung von Schadmetallbelastungen am lebenden Tier.
Holm, J.
***Fleischwirtschaft*** 61 (5) 801–803 (1981) [many ref. De, en] [Staatliches Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, D-3300 Braunschweig, Federal Republic of Germany]

The early detection of Pb contamination of slaughter animals from hair and blood of live animals was investigated. Pb concn. in hair and blood from live animals were related to concn. in liver and kidneys after slaughter. Tabulated data are given for cattle from a clean air area and a polluted area, and for 20 groups of 4–5 pigs given <0.3–614 mg Pb/kg air-dried feed. In normally contaminated beef, only very low correlation coeff. were found between Pb contents in hair, blood and organ samples. The mean ratio of Pb levels in blood and liver was about 1:10 for both contaminated and uncontaminated beef herds, allowing a rough prediction of the degree of contamination in the herd. Increasing the Pb content in pig feed produced parallel rises in the hair and organs, the rise in the hair being about 2–4 times as high as that in the organs and providing a sensitive index of contamination. Increasing the Pb content in the feed from up to 5–7 mg/kg raised the concn. in liver to 0.3–0.6 mg/kg and in hair to 0.8–1.1 mg/kg. Further increases raised the Pb levels in liver to >0.8 mg/kg, the max. permitted concn. A concn. of 0.8 mg/kg in liver was associated with about 1.7 in hair. Data are tabulated for Pb contents in muscle, liver and kidney for the 20 pig feeding groups. RM

### 79

**[Solvent for individual polarographic determination of copper and lead.]**
Balesnaya, A. N.; Levin, A. Ya.; Shragovich, Ya. Z.
***Gigiena i Sanitariya*** No. 1, 77–78 (1982) [4 ref. Ru]

The Soviet Standard GOST 18293-72 on "Drinking water" recommends a 0.1N orthophosphoric acid solvent for polarographic detn. of Cu and Pb; although this solvent distinguishes Cu and Pb, other metals (Ni, Cd, Zn) cannot be determined simultaneously. A new solvent for simultaneous detn. of (i) Cu, Pb, Cd, Ni and Zn in a sample was compared with the GOST solvent. The new solvent contains (in 1 l) 110 g $NH_4Cl$, 110 g KCl and 90 ml of 25% ammonia: before introduction into the cell, to 5 ml solvent are added 0.3–0.4 g ascorbic acid and 0.3–0.4 g $Na_2SO_3$. Polarographs are given for (i) using the 2 solvents: clear peaks for all the elements are only visible using the new solvent. RAW

### 80

**[Simultaneous polarographic determination of lead and molybdenum (VI) in plants.]**
Lapitskaya, S. K.; Sviridenko, V. G.
***Agrokhimiya*** No. 8, 123–125 (1981) [8 ref. Ru]
[Gomel'skii Gosuniv., USSR]

### 81

**[Pb in the environment.]**
Defrancesco, F.
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** 10 (2) 117–124 (1981) [7 ref. It]
[Lab. Chim. Provinciale, Trento, Italy]

Problems with Pb pollution of the environment are discussed with reference to data for Pb concn. in air, water, wine, milk, cheese, canned vegetables, fruit juices and beverages in Italy, and also for Pb concn. in human blood and urine samples. Factors affecting Pb levels (processing, canning, etc.) in foods are discussed, and sources of Pb contamination are considered, with special reference to leaded petrol, Pb in tin used in can manufacture, and industrial uses of Pb. AJDW

### 82

**(Pb and Cu contents of canned cooked meals.]**
Sanchez Saez, J. J.; Santos, M. D.; Cirugeda, M. E.
***Boletin del Centro Nacional de Alimentacion y Nutricion*** No. 5, 14–17 (1981) [18 ref. Es, en]

Pb and Cu contents were determined by AAS in 328 canned foods. Results, shown graphically and in a table, revealed that Pb contamination was due mainly to the manufacturing process or the can, Cu mainly to the raw material. Values for Pb were mainly between 0 and 500 parts/billion (p.p.b.). Only 3.6% of the samples contained >2 p.p.m. Pb, though 20% of canned vegetables contained >1 p.p.m. 190 samples contained ≤2 p.p.m. Cu, only 11 samples >7 p.p.m. and only 1 sample >12 p.p.m. RM

### 83

**[Determination of copper, lead and cadmium in tea by graphite furnace atomic absorption spectrophotometry.]**
Tsushida, T.; Takeo, T.
***Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi]*** 27 (11) 585–589 (1980) [15 ref. Ja, en] [Nat. Res. Inst. of Tea 2769 Kanaya, Kanaya-cho, Haibara-gun, Shizuoka-ken, Japan]

Cu, Pb and Cd were determined in tea samples ashed at 500°C by graphite furnace AAS. Extraction of the metals by the iodide-MIBK procedure removed interferences by other ions. Detn. of Cu, Pb and Cd in 54 samples from various districts gave mean levels of 11.9, 0.31 and 0.023 μg/g, resp. [From En summ.] JRR

### 84

**[Pb content of apples and pears. II.]**
Spadoni, S.; Nurzia, N.; Massi, C.; Gasperi, E.; Micozzi, F.; Spile, E.
***Rivista della Societa Italiana di Scienza dell'Alimentazione*** 10 (3) 153–154 (1981) [It, en] [Lab. di Chimica Interzonali, Unita Sanitaria Locale, Rome 1, Italy]

Studies were conducted on Pb concn. in peel and flesh of 343 apples and 37 pears from various countries, data being presented for mean, max. and min. values for each country. Max. Pb concn. in the peel and the flesh of apples were 0.65 and 0.27 p.p.m. (fresh wt. basis) resp.; corresponding values for pears were 0.78 and 0.31 p.p.m. resp. AJDW

### 85

**[Effects of raw materials and equipment on concn. of Cu, Zn and Pb in confectionery. I. Raw materials and chocolate products.]**
Stanculescu, C.; Buzoianu, A.; Iliescu, M.; Landauer, I.
***Lucrari de Cercetare, Institutul de Cercetari pentru Industrie si Chimie Alimentara*** 13, 249–262 (1978) [17 ref. Ro, en, de, fr, ru] [Inst. de Cercetari pentru Ind. si Chimie Alimentara, Bucharest, Romania]

Data are given for levels of Cu, Zn and Pb (mean values and ranges) in 19 raw materials used in confectionery manufacture, including cocoa beans, cocoa butter, sugar, dried milk, jam, honey, nuts, peanuts, corn germ flour, fats, coffee beans, citric acid, flavourings and colorants. Values are also given for levels of these elements in chocolate at various stages of manufacture, and in cocoa powder, cocoa butter and chocolate dragees. AJDW

## 86

**[Study on amounts of trace elements in marine fishes. V. Distribution of heavy metals and arsenic in flatfish graymullet and gizzard-shad tissue.]**
Katsuki, Y.; Ishii, H.; Itoh, A.; Naoi, Y.; Kimura, Y.
***Annual Report of Tokyo Metropolitan Research Laboratory of Public Health*** 31 (1) 174–179 (1980) [23 ref. Ja] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Concn. of As and heavy metals in muscles and internal organs of the 3 title fish spp. are tabulated (in En) as means and ranges. Mean concn. in (i) flatfish muscle (33 samples) (ii) and (iii), white and red muscle, resp. of grey mullet (12 + 12) and (iv) and (v) white and red muscle, resp. of gizzard-shad (20 + 20) were as follows (p.p.m. wet basis) for (i)–(v) resp.: total Hg 0.05, 0.02, 0.02, 0.02, 0.02; Pb 0.07, 0.07, 0.06, 0.12, 0.13; Cd 0.01, 0.01, <0.01, 0.01, 0.02; Cr 0.06, 0.03, 0.04, 0.05, 0.03; Cu 0.20, 0.16, 2.1, 0.46, 2.9; Zn 4.6, 3.8, 9.0, 4.3, 8.8; Mn 0.10, 0.08, 0.13, 0.64, 0.81; Co 0.02, 0.03, 0.03, 0.02, 0.02; As 1.6, 0.37, 0.64, 0.34, 1.5. [From En tables.] DIH

## 87

**[Influence of fat intake on the lead metabolism in piglets.]** Zum Einfluss unterschiedlicher Fettzufuhr auf den Bleistoffwechsel bei Ferkeln.
Schenkel, H.; Berschauer, F.; Rupp, J.
***Landwirtschaftliche Forschung, Sonderheft*** No. 37, Kongressband 1980, 373–382 (1981) [many ref. De, en, fr] [Univ. Hohenheim, D-7000 Stuttgart 70, Federal Republic of Germany]

The effects of 12% sunflower oil or coconut fat and rising levels of Pb in the feed on Pb concn. in the tissues (muscle, liver, kidneys) and Pb balance were studied in feeding trials. Tabulated results showed that fat supplements, especially sunflower oil, significantly increased incorporation of Pb in liver and kidneys, (from 0.96 to 2.86 and from 0.76 to 2.16 p.p.m. resp.), but had no great effect on Pb levels in muscle. RM

## 88

**Lead in canned foods.**
Schaffner, R. M.
***Food Technology*** 35 (12) 60–62, 64 (1981) [9 ref. En]

Effects of exposure to Pb on health, and typical exposure to Pb in the USA are discussed with reference to dietary intake, and the particular vulnerability of infants and young children is stressed. Role of the FDA in lowering Pb levels in food in the USA is described, and effects on Pb contents in foods and formulas for infants and children are surveyed. Pb contents in such foods are presently 0.015–0.08 p.p.m., and in normal canned foods (also eaten by children from early ages) 0.21 p.p.m. The FDA has achieved a reduction in Pb levels by persuading industry to improve containers; further action planned to ensure maintenance or reduction of present levels includes establishing specific action (i.e. seizure) levels of Pb in infant foods. DIH

## 89

**Food processors benefit from 2-piece vs. 3-piece can technology race.**
Andres, C.
***Food Processing*** 42 (6) 124–126 (1981) [En]

Advantages and drawbacks of 2- and 3-piece cans are discussed in the light of comments from can manufacturers and food processors. 2-piece cans eliminate side- and bottom-seams, thus reducing solder contact areas and Pb contamination, and improving can integrity. 3-piece cans with welded side seams also eliminate Pb contamination from this source, and are preferred for foods where both ends of the can are opened for serving. FDA figures are presented to show that levels of Pb in canned foods have declined since 1974, probably due to the advent of 2-piece cans and welded side seams. JRR

## 90

**[Reproducibility and comparability of determination of Pb in wine by various AAS methods.]** Zur Wiederholbarkeit und Vergleichbarkeit von Bleibestimmungen in Wein nach verschiedenen atomabsorptionsspektralphotometrischen Untersuchungsmethoden.
Ristow, R.; Bernau, M.
***Deutsche Lebensmittel-Rundschau*** 78 (4) 125–130 (1982) [6 ref. De, en, fr] [Chem. Untersuchungsamt Koblenz, Neverstrasse 4-6, 5400 Koblenz, Federal Republic of Germany]

A collaborative study involving 9 laboratories is described; 2 wines were used, each laboratory using its own AAS procedure. Tables of results are given, together with statistical analyses. Reproducibility of the results was 0.083 mg/l; comparability was 0.169 mg/l. 3 laboratories gave aberrant results; reasons for this are considered. It is concluded that the procedures used permitted evaluation of compliance with legal limits. Establishment of an official AAS procedure is considered. AJDW

## 91

**[Heavy metals in foods. II. The Pb content of raw cocoa beans and semi-manufactured and fully processed cocoa products.]** Schwermetalle in Lebensmitteln. II. Über den Gehalt an Blei in Rohkakao und in Kakao-Halb- und Fertigprodukten.
Knezevic, G.
***Deutsche Lebensmittel-Rundschau*** 78 (5) 178–180 (1982) [12 ref. De, en, fr] [Fraunhofer-Inst. für Lebensmitteltech. & Verpackung, Schragenhofstrasse 35, 8000 Munich 50, Federal Republic of Germany]

This paper includes data for the Pb content (determined by AAS) of cocoa beans, cocoa products and chocolate at various stages of processing. Ranges of values (with number of samples in parentheses) were (mg/kg): cocoa beans (64) 0.05–1.4; chocolate (36) 0.02–0.50; chocolate with fillings or added ingredients (5) 0.05–0.10; chocolates (4) 0.06–0.12; cocoa powder (5) 0.11–0.27; and instant cocoa drink powders (5) 0.08–0.20. [See FSTA (1980) 12 3K21 for part I.] AJDW

## 92

**[Organic and mineral contamination of milk.]**
Vecchio, A.
***Latte*** 5 (7/8) 509–513 (1980) [21 ref. It] [Istituto Ind. Agrarie, Univ. di Milano, Milan, Italy]

Data from surveys carried out in Italy on organic pesticide residues in raw, pasteurized and sterilized cows' milk during 1975 [see FSTA 8 2P381], 1976 [FSTA 9 5C225], 1977 and 1978 [unpublished results] and 1979 are discussed. There was a general decrease in milk pesticide levels during the 5-yr period; *p,p'*-DDE was the only DDT derivative found in the 1978 and 1979 survey samples. Residue levels were consistently lower in processed milk than in raw milk. Data from similar surveys on milk from other spp. (sheep, goat and buffalo) are also reviewed [see also FSTA 12 4P806]. Particularly high levels of HCH and DDT were found in samples from Sardinia and Caserta. Analyses of human colostrum and mature milk carried out in 1975–1977 [*Latte* (1975) Dec., 731–736; (1976) 1 (6) 317–321; (1978) 3 (1) 4–14] also indicate high contamination due to DDT + derivatives and Pb. Heavy metal contamination of milk is now considered to be a greater problem than that of pesticides. MC

## 93

**Matrix modifier and L'vov platform for elimination of matrix interferences in the analysis of fish tissues for lead by graphite furnace atomic absorption spectrometry.**
May, T. W.; Brumbaugh, W. G.
***Analytical Chemistry*** 54 (7) 1032–1037 (1982) [27 ref. En] [Columbia Nat. Fisheries Res. Lab., US Fish & Wildlife Service, Route 1, Columbia, Missouri 65201, USA]

A chemical modifier ($NH_4H_2PO_4$) and a modified L'vov platform were investigated and found useful for alleviation of matrix interferences, which are normally severe, during graphite furnace AAS analysis of fish tissues for Pb. AL

## 94

**[Evaluation of risks associated with use of anti-fouling paints in mollusc-culture areas.]**
Alzieu, C.; Thibaud, Y.; Heral, M.; Boutier, B.
***Revue des Travaux, Institut des Peches Maritimes*** 44 (4) 301–348 (1980) [57 ref. Fr] [Dep. Environment & Ecosystemes, Inst. Sci. & Tech. des Peches Maritimes, 44031 Nantes Cedex, France]

This paper on possible contamination of oysters by toxic substances derived from antifouling paints includes tables of data for levels of Pb, Cd, Cu, Zn, Fe and Sn for digestive glands, gills, *adductor* muscle and shell of oysters from various sites in the vicinity of Brest, Lorient, Marennes-Oleron, Arcachon, and Saint-Jean de Luz. The relation of levels of these metals in the tissues to the local industrial or dockyard-derived pollution is discussed. AJDW

## 95

**Additives and contaminants in the food supply.**
Elton, G. A. H.
***Food Technology in Australia*** 33 (4) 184–188 (1981) [11 ref. En] [Min. of Agric., Fisheries & Food, London, UK]

The problems of ensuring that the nation's food supply is wholesome and safe are discussed. The assessment of short-term and long term hazards, and the toxicological testing of food additives are briefly considered. Examples considered are: the use of sodium nitrite as a meat curing additive; the use of saccharin as a sweetener; the presence of heavy metals as contaminants; and the presence of aflatoxin in mould-infested foodstuffs. VJG

## 96

**Health hazards from toxic contamination of foods.**
Chakravarti, R. N.
***Journal of the Institution of Chemists (India)*** 52 (6) 216–225 (1980) [16 ref. En] [Indian Inst. of Exp. Med., Calcutta, India]

Causes of, and the health hazards arising from, toxic contamination of foods, are discussed referring, in particular, to: metals like Cu and Pb; harmful adulterants like methanol, or Mexican poppy (*Argemone mexicana*) seed oil in mustard seed oil, or of *Lathyrus sativus* grains in pulses; insecticides like follidol (parathion) and tri-ortho-cresyl phosphate; moulds that produce ergot or aflatoxins; and fish and shell-fish that produce substances like tetrodotoxin and saxitoxin. CFTRI

## 97

**[Removal of heavy metals in water treatment.]**
Zacek, L.
***Vodni Hospodarstvi, B*** 31 (10) 255–258 (1981) [14 ref. Cs, ru, en] [Res. Inst. of Water Management, Prague, Czechoslovakia]

In the treatment of drinking water, the presence of heavy metals (Hg, Pb, Cr, Cu, Cd, Ni, Zn and sometimes As) is a formidable problem in industrial environments. Results of 5 yr testing show that the most suitable means for eliminating them is (i) alkaline clarification with ferrous sulphate, (ii) decarbonization and (iii) sorption on activated carbon. To achieve high efficiency with (i) and (ii) the pH must be high enough for heavy metals to be present in insoluble form. Effect of (iii) is very dependent on type of sorbent, dosage, and filtration rate. The correct choice of the appropriate technological procedure for removing heavy metals is also dependent to a considerable degree on the type and concn. of heavy metal concerned, as well as on the overall composition of the raw water. STI

## 98

**[Natural content of lead in wines and degree of pollution from various sources.]**
Danilatos [Danelatos], N.
***Georgike Ereuna*** 5 (1) 83–94 (1980) [20 ref. Gr, fr] [Wine Inst., Lykovryssi, Attica, Greece]

Pb content of Greek wines was investigated from the viewpoint of establishing a max. limit for Pb in wines. 46 wines made experimentally were analysed for Pb; all contained $<0.4$ mg/l, with 76% containing 0.05–0.24 mg/l. Commercial Greek wines were sampled; of the 55 samples 42% contained $\geq 0.4$ mg/l, with 11 (20%) containing 0.65–1.84 mg/l. Effect of Pb from car exhausts was studied by sampling wines made from rows of vines growing next to busy roads and from vines parallel to these but 50 m from the road. Pb contents were slightly elevated in vines from grapes grown nearer the road (contents up to 0.54 mg/l vs. up to 0.39 mg/l) but the bulk of samples still contained $<0.4$ mg/l. Addition of 150 mg $SO_2$/l of wine had no effect on Pb content. Rinsing grapes before vinification reduced Pb content in wine, e.g. from 0.07–0.51 to 0.00–0.28 mg/l. High levels of Pb in commercial wines were assumed to be due to contamination during winemaking and bottling. Natural Pb content of Greek wine is up to 0.4 mg/l, with the median being approx. 0.2 mg/l. Reduction of the present max. permitted Pb content of 0.5 mg/l is not recommended. Significance of the Pb contents of wine for human health is discussed. DIH

## 99

**Potentiometric stripping analysis in flow cells.**

Anderson, L.; Jagner, D.; Josefson, M.

***Analytical Chemistry*** 54 (8) 1371–1376 (1982) [25 ref. En] [Dep. of Analytical & Marine Chem., Chalmers Univ. of Tech., S-412 96 Göteborg, Sweden]

A thin layer cell with a Hg coated glassy carbon working electrode for use in connection with potentiometric stripping analysis is described. A 6-step inlet valve permits the reoxidation to take place in a solution of optimum composition irrespective of sample composition. The increased selectivity thus obtained is demonstrated by detn. of Tl(I) in a $10^4$-fold excess of Cd(II). The dependence of the potentiometric stripping on the flow rate is evaluated and detection limits for Cd, Pb and Cu are given. The flow system was applied to detn. of Pb(II) in wine samples. AS

## 100

**[The contents of heavy metal in fruits and vegetables collected from Jinju district.]**

Kim, M. C.; Sung, N. K.; Shim, K. H.; Lee, M. H.; Lee, J. I.

***Korean Journal of Food Science and Technology*** 13 (4) 299–306 (1981) [22 ref. Ko, en] [Dep. of Food Sci. & Tech., Gyeongsang Nat. Univ., Jinju 620, S. Korea]

Contents of heavy metals in fruit and vegetables collected from Jinju in Korea during June 1980–March 1981 were determined by AAS. Results are tabulated and statistically analysed. Moisture % was 65.3 in garlic to 95.9 in cucumber; Cu was (mean p.p.m.) 0.310 in cucumber to 1.821 in pepper; Pb was (mean p.p.m.) 0.423 in tomato to 1.082 in pear; Zn (mean p.p.m.) was 0.625 in tomato to 10.252 in radish; Ni was (mean p.p.m.) trace in cabbage, carrot and sweet potato to 0.353 in tomato; Hg was (mean p.p.m.) trace in cucumber, tomato, and pepper to 0.204 in lettuce; Cd was (mean p.p.m.) 0.021 in pear, lettuce and cabbage to 0.113 in radish; Mn was (mean p.p.m.) 0.907 in tomato to 16.122 in water celery; Fe was (mean p.p.m.) 0.397 in tomato to 19.916 in spinach. [From En summ.] LH

## 101

**[Contents of arsenic, copper, lead and zinc in some fruit and vegetable preserves.]**

Jason, K.; Malasiewicz, A.

***Bromatologia i Chemia Toksykologiczna*** 14 (3/4) 317–318 (1981) [9 ref. Pl] [Lab. Chem.-Mikrobiol. Zakladu Spozywczego Osrodka Badawczo-Rozwojowego Produkcji Lesne 'Las', Sopoc, Poland]

Min. and max. concn. of As, Cu, Pb and Zn are tabulated for 15 types of jam and various vegetable preserves (gherkins, red cabbage, red peppers, beetroot) manufactured by the Las food factory in 1977–1979. HBr

## 102

**[Contamination of foods with Pb and Cd. Analysis of meat products.]**

Bolasco, A.; Memoli, A.; Botre, C.

***Rivista della Societa Italiana di Scienza dell'Alimentazione*** 10 (3) 147–152 (1981) [20 ref. It, en] [Cattedra di Chimica Fisica, Univ. di Roma, Rome, Italy]

Data are presented for concn. of Pb and Cd (determined by AAS) in samples of beef muscle, spleen, kidneys and liver; veal muscle, spleen, kidneys, liver, heart, lungs, intestines and sweetbreads; chicken muscle and liver; turkey muscle; and pork muscle, spleen, liver, kidneys, raw ham and sausages. Max. Pb concn. recorded (p.p.m.) were 4.3 in beef liver, 4.2 in beef muscle, 4.5 in raw ham, 4.2 in pork kidney and 4.1 in pork liver. Max. recorded Cd concn. (p.p.m.) were 1.42 in beef kidney, 0.87 in veal kidney and 0.68 in pork kidney. The results are discussed in relation to FAO-WHO recommended monthly intakes; it is calculated that intakes of Pb and Cd in Italy may be resp. 195% and 180% of the FAO-WHO recommended levels. AJDW

## 103

**[Toxic metals in raw materials and products of the meat industry.]**

Dordevic, D.; Milohnoja, M.; Dujic, I.; Radovic, N.

***Tehnologija Mesa*** 22 (11) 312–315 (1981) [15 ref. Sh, en] [Jugoslovenski Inst. Tehnologiju Mesa, Belgrade, Yugoslavia]

Muscle, fatty tissue, kidneys and liver of cattle and pigs, and canned hams and pork shoulders, were analysed for As, Sb, Cd, Hg, Pb and Se. Data are given for the proportions of samples in which heavy metals were found, and for mean and max. concn. detected (with s.d. and coeff. of variation). Levels of heavy metals in the canned products were within tolerance limits. 13 additives commonly used in meat processing were also analysed. STI

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